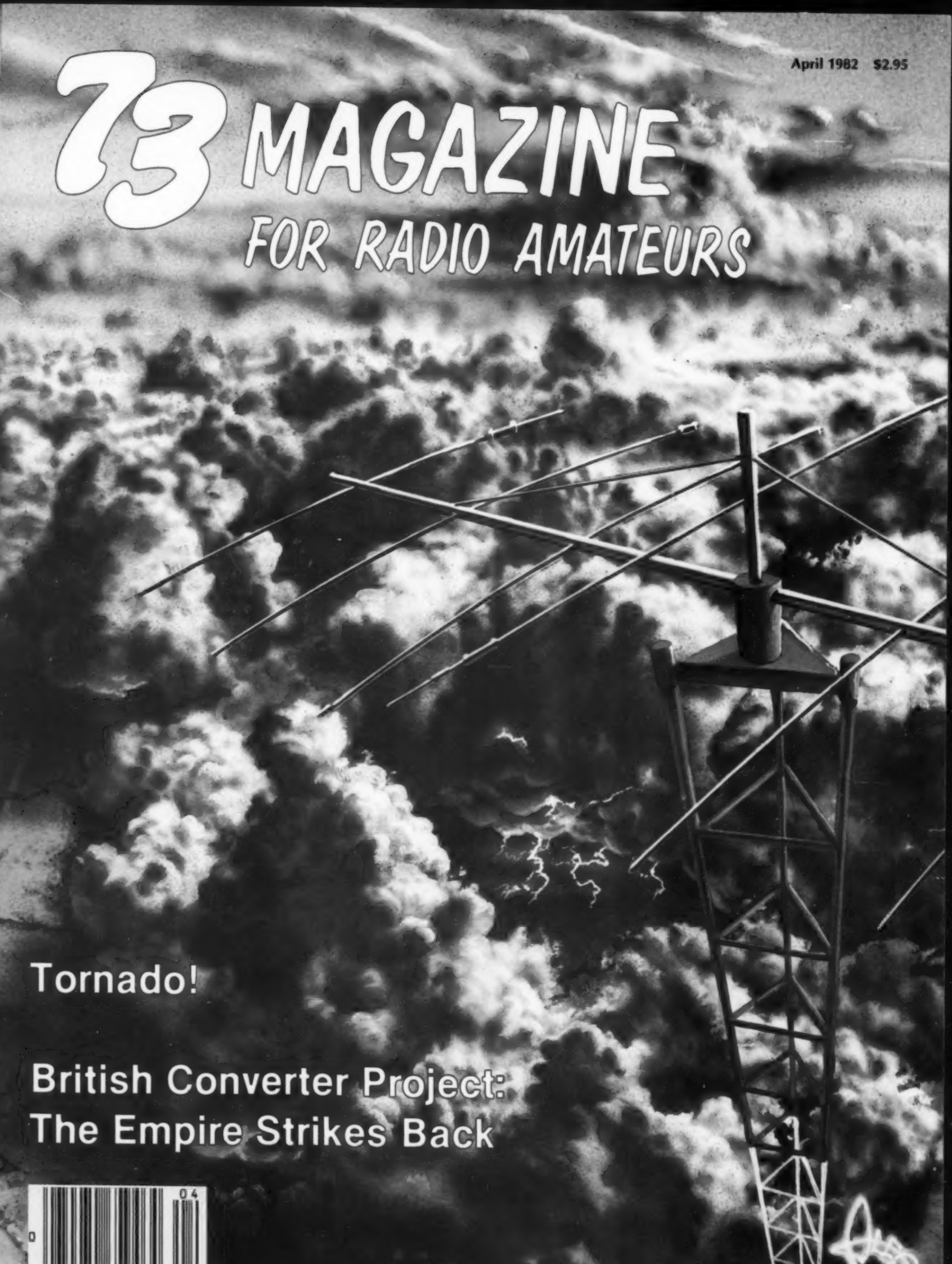
April 1982 $2.95

73 MAGAZINE

FOR RADIO AMATEURS



Tornado!

British Converter Project:
The Empire Strikes Back

ICOM IC-290A

The Latest State of the Art in 2 Meter Mobile

AGC
NB
ICOM
144MHz ALL MODE TRANSCEIVER
IC-290A
RECV
SEND
PRIO
DUP
S/RF
1 — 3 — 5 — 9 — 20 — 60
CALL
MEMORY
1
2
3
4
5
DUP
DUP
USB
CW
FM
LSB
MODE
PRIORITY
A
B
S/S
RIT
M-R
WRITE
OFFSET WRITE
1kHz
RIT
SQL/PULL LOW
MIC

5 Memories/Priority/ Scan/Squelch on SSB.

FM Ease.

☐ Five memories + 2 VFO'S - store your favorite repeaters.

☐ Priority channel - check your most important frequency automatically.

☐ Programmable offsets - for odd repeater splits.

☐ 5 KHz or 1 KHz tuning.

SSB/CW Convenience.

☐ Squelch on SSB - silently scan for signals.

☐ 2 VFO's with equalizing capability - mark your signal frequency with the touch of a button.

☐ RIT - receiver incremental tuning.

☐ 1 KHz or 100 Hz tuning.

☐ CW sidetone.

☐ AGC - selectable slow or fast in SSB and CW.

☐ NB - Noise blanker - suppresses pulse type noises on SSB/CW.

Full Capability Scanning.

☐ Scan the whole band/scan between VFO's/scan memories and VFO's.

☐ Automatic stop and automatic resume scan after carrier drop or predetermined adjustable delay.

☐ Adjustable scan rate.

☐ 15 KHz or 5 KHz FM scanning steps.

☐ Stop on busy or empty channels.

ICOM Performance.

☐ 143.8 to 148.199.9 MHz coverage.

☐ Remote tuning from optional HM 10 microphone.

☐ Digital frequency display - significant digits only.

☐ Hi/low power switch.

☐ LED indicators - RECV/SEND/PRIO/DUP

☐ LED bar meter.

☐ Provision for retention of memory with optional NiCd battery system.

☐ Touch Tone® with HM8 Microphone standard.

☐ Compact size - 6 11/16W × 2 1/2H × 8 5/8D.

ICOM

2112 116th Avenue N.E., Bellevue, WA 98004
3331 Towerwood Dr., Suite 307, Dallas TX 75234

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

5-STORE BUYING POWER *in action!*

KLM/TRI-EX

Product No.	Description	Regular	Special
KT-34A	4 el. Tri-band	$389.95	**$319.00**
KT-34XA	6 el. Tri-band	$569.95	**$469.00**
7.2-1	4OM rotatable dipole	$199.95	**$159.00**
7.2-2	40M 2 el. beam	$349.95	**$299.00**
7.2-3	40M 3 el. beam	$529.95	**$449.00**
7.0-7.3-4A	40M 4 el. beam	$749.95	**$629.00**

Product No.	Description	Regular	Special
144-148-13LB	2M, 13 el. long boom	$ 89.95	**$ 77.95**
432-16LB	432MHz. 16 el. long boom	$ 74.95	**$ 60.70**
144-150-16C	2M, 16 el. Cir. pol.	$116.95	**$ 93.55**
420-450-18C	435 MHz, 18 el. Cir. pol.	$ 69.95	**$ 58.70**
TRI-EX W51	51 foot tower.	$999.95	**$829.95**

PRICES ARE FOB CALIFORNIA. FREIGHT IS EXTRA.

WE'LL MATCH OR BEAT ANY LEGITIMATE KLM/TRI-EX PRICE!

COMBO DEALS

W51 tower
w/KT-34A antenna
$1099

W51 tower
w/KT-34XA antenna
$1239

FREIGHT EXTRA

ALL ABOVE IN STOCK...NO WAIT! *Call for prices on all KLM/TRI-EX items*

MIRAGE B1016
2 METER AMPLIFIER

160W
OUTPUT
SSB, FM, CW

Freq. range:144-148MHz ● RF out:160W nom. (10W in) ● RF power in. 5-15W ● DC operating pwr: 13.8VDC @ 20-25A ● Intermittent duty cycle ● Built-in receiver pre-amp. Automatic internal or external relay keying.

REGULAR $279.95 **$249.95**

COLLINS/ROCKWELL

KWM-380

Limited quantity priced lower than dealer wholesale

Beat the price increase

PHONE TODAY. SAVE!

ETO ALPHA

All ALPHA amplifiers are in stock for fast delivery

CALL FOR SPECIAL PRICES

NEW!
YAESU FT-ONE
TRANSCEIVER

CALL FOR YOUR SPECIAL PRICE ON THIS GREAT NEW SET

KENWOOD *Big Four!*

Cash in on our 5-store buying power. Most items in stock and at lower prices. **CALL NOW!**

TS-130S
TR-7730
TS-830S
TR-2500

FREE PHONE 800 854-6046

9:30AM to 5:30PM PACIFIC TIME.
OVER-THE-COUNTER, 10AM to 5:30PM.
MONDAY THROUGH SATURDAY
CALIFORNIA CUSTOMERS PLEASE PHONE OR VISIT LISTED STORES.

FREE SHIPMENT *(U.P.S. Brown)* *CONTINENTAL U.S.A.*

SERVING HAMS BETTER.
North...south...east...west.

Bob Ferrero, W6RJ/K6AHV, Jim Rafferty, N6RJ other well known hams give you courteous, personalized service.

HAM RADIO OUTLET™

ANAHEIM, CA 92801
2620 W. La Palma,
(714) 761-3033 (213) 860-2040
Between Disneyland & Knott's Berry Farm

BURLINGAME, CA 94010
999 Howard Ave., (415) 342-5757
5 miles south on 101 from S.F. Airport.

OAKLAND, CA 94609
2811 Telegraph Ave., (415) 451-5757
Hwy 24 Downtown. Left 27th off-ramp.

SAN DIEGO, CA 92123
5375 Kearny Villa Road (714) 560-4900
Hwy 163 & Clairemont Mesa Blvd.

VAN NUYS, CA 91401
6265 Sepulveda Blvd., (213) 988-2212
San Diego Fwy at Victory Blvd.

AEA • ALLIANCE • ALPHA • AMECO • AMPHENOL • ARRL • ASTRON • AVANTI • BENCHER • BERK-TEK • BIRD • B&W • CALLBOOK • CDE • COLLINS • CUBIC • CURTIS • CUSHCRAFT • DAIWA • DATONG • DENTRON • DRAKE • DX ENGINEERING • EIMAC • HUSTLER • HY-GAIN • ICOM • J.W.MILLER • KENWOOD • KLM • LARSEN • LUNAR • METZ • MFJ • MICRO-LOG • MINI-PRODUCTS • MIRAGE • NYE • PALOMAR • ROBOT • ROHN • SHURE • SWAN • TELEX • TELREX • TEMPO • TEN-TEC • TRISTAO • YAESU and many more!

Prices, specifications, descriptions subject to change without notice. Calif. residents please add sales tax.

INFO

Manuscripts

Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. All contributions should be directed to the *73* editorial offices. "How to Write for 73" guidelines are available upon request.

Editorial Offices:

Pine Street
Peterborough NH 03458
Phone: 603-924-9471

Advertising Offices:

Elm Street
Peterborough NH 03458
Phone: 603-924-7138

Circulation Offices:

Elm Street
Peterborough NH 03458
Phone: 603-924-9471

Subscription Rates

In the United States and Possessions:
One Year (12 issues) $25.00
Two Years (24 issues) $38.00
Three Years (36 issues) $53.00

Elsewhere:

Canada—$27.97/1 year only, U.S. funds. Foreign surface mail—$44.97/1 year only, U.S. funds. Foreign air mail—please inquire.

To subscribe, renew or change an address:

Write to *73 Magazine*, Subscription Department, PO Box 931, Farmingdale NY 11737. For renewals and changes of address, include the address label from your most recent issue of *73*. For gift subscriptions, include your name and address as well as those of gift recipients. Postmaster: Send form #3579 to *73 Magazine*, Subscription Services, P.O. Box 931, Farmingdale, NY 11737.

Subscription problem or question:

Write to *73 Magazine*, Subscription Department, PO Box 931, Farmingdale NY 11737. Please include an address label.

73 Magazine (ISSN 0098-9010) is published monthly by 73, Inc., a subsidiary of Wayne Green, Inc., 80 Pine Street, Peterborough NH 03458. Second class postage paid at Peterborough NH 03458 and at additional mailing offices.

Entire contents copyright 1982, Wayne Green, Inc. All rights reserved. No part of this publication may be reprinted or otherwise reproduced without written permission from the publisher.

Microfilm Edition—University Microfilm, Ann Arbor MI 48106.

1750 Meter XMTR

Palomar Engineers
1750 Meter Transmitter
ON
OFF
XTAL
VOLTAGE
KEY
RF
GND

$145.00

This 160-190 KHz transmitter kit is easy to build. The power supply and exciter portions are factory wired and tested, the Litz wire coils are wound and complete instructions are supplied so you can build it in one evening. The main unit with control panel (shown above) installs at your operating position. The active antenna matching network mounts at the base of your vertical antenna. A 50' antenna is permitted. Shorter antennas can be used. Transmitter operates from 115-v AC. One watt input crystal controlled (crystal supplied). No license needed. Meets all FCC requirements. Not for use in Canada.

Enter the fascinating world of low frequency radio. Order your transmitter today! Free brochure on request.

Complete your 1750 meter station with:

New
OFF ON
Palomar Engineers
VLF Converter

VLF CONVERTERS
$79.95

Now available in two models. Converts the band 10-500 KHz up to 3510-4000 KHz (model VLF-A) for amateur band receivers. Or to 4010-4500 KHz (Model VLF-S) for general coverage digital readout receivers. Now you can tune your receiver and hear the 1750 meter band, navigation radiobeacons, ship-to-shore, and the European low frequency broadcast band.

Palomar Engineers
Loop Antenna

LOOP ANTENNA

Amplifier $77.50
Plug-in Loops $59.95

A low noise receiving antenna. Connects to your receiver or VLF converter. Plug-in loops cover 10 KHz to 15 MHz (VLF plug-in covers 150-550 KHz). Rotates 360°, tilts ±90° to null out interference. Manmade noise limits low frequency reception. The loop antenna helps! Free brochure on request.

VISA MasterCard

Order today direct or from your favorite dealer. To order direct include $3 shipping/handling. Add sales tax in Calif. Order today!

Palomar Engineers

1924-F West Mission Road, Escondido, CA 92025
Phone (714) 747-3343

Watching the Weather
—a cheap and easy conversion
....KA9GDL 10

The Sinkhole That Ate Winter Park
—hams vs. hole........................KA4RUL 18

TVRO Dish Selection Tactics
TV —Satellite Central, part V
....Gibson 54

Taylor Howard: TVRO Trailblazer
TV N8RK 60

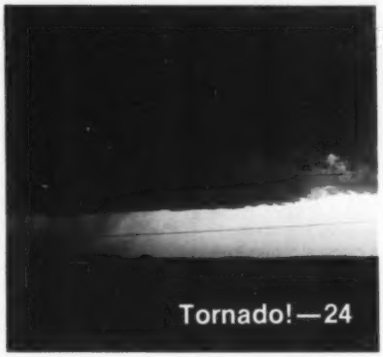
TVRO Q & A
TV —advice from WB0POP—part II
....WB0POP 62

apr. 82

73 MAGAZINE

Vol. XXII No. 7

Sinkhole—18



Tornado!—24

MICROLOG/ACT-1

ACT-1—120

Operation Skywarn
—tracking tornadoes with two meters
....WB5ZAM 24

Measure Ohms with Your Calculator?
—yes, and accurately, too!.......Johnson 28

Scanning with the IC-280
....N7AAD 36

Detect Killer Tornadoes
—use an ordinary TV set................K2VJ 50

VHF Converter
—easy to build, yet state of the art
....Edwards 68

Compugrams Are Here
—BASIC message handling
....WA6ZZL 76

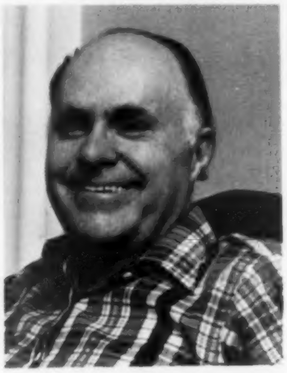
Flash and Crash 101
—how to weather the storm......K1NYK 94

Stormy Weather
—to be forewarned is to be forearmed
....W9CGI 102

Never Say Die—6, Social Events—82, Ham Help—86, 136, 144, 145, 146, Review—120, DX—123, Fun!—125, Reader Service—130, New Products—132, Letters—134, RTTY Loop—137, Contests—138, Awards—141, Corrections—145, OSCAR Orbits—146, Propagation—177, Dealer Directory—177

Cover: This month's cover by Alex Stevens depicts the astonishing 350-meter (1148') rotating tower of French amateur Pierre Avril F0OL. Erected during the spring and summer of 1981, the massive structure tapers from 5.25 meters (17' 2-5/8") at the base to 1.25 meters (4' 1-1/4") at the top. It was designed with the assistance of Swedish engineer Vassa Loppet SL1M and is constructed entirely of scrap metal salvaged from the Saturn V project and Soviet world's fair exhibits. Pierre, who operates mostly CW, is an avid county hunter and holds numerous operating awards. He credits his now potent signal to the use of 6-cm (2-1/4") nitrogen-filled hardline, his trusty TH6DXX, and the selection of a hilltop QTH. This triumph of the amateur spirit is located at Pierre's home in the quiet village of St.-Fou-des-Ondes-Courtes, Dept. de la Haute Tour, southern France. Look for the construction details on this monster in an upcoming issue of 73.

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green



WE'VE BEEN BASHED

Word has leaked out that Dick Bash, the chap who publishes the books with the answers for the FCC tests, is about to bring suit against *QST* because they won't let him advertise his books. Well, I don't know what their excuse is for that. I suspect that they just don't want to help sell a book in direct competition with their *Q&A Manual*, which does about the same thing, only not quite as well.

There was a fuss a little while back when the FCC was reported to have lowered the boom on *Ham Radio* magazine, essentially telling 'em that if they continued to carry ads for the Bash books, the FCC would cut off information for their *HR Reports* (now defunct). The FCC has made no bones about being very upset over what they see as a total defeat of their license exams.

My own view is that Bash's books are one of the most destructive forces in amateur radio. They have removed the last vestige of need for a newcomer to bother to learn even a shred of knowledge about the technical end of things, opening the gates to anyone who can learn the code at five words per minute. We've seen that kids of four can do that, so it certainly is no accomplishment worthy of great pride. And so, while on the one side I see most hams demanding that *only* the code be used to keep out the undesirables, on the other I hear them bitching about the growing mayhem on the bands as new turkeys get on the air.

The Bash books, as far as I'm concerned, are a poison which is rapidly sapping the strength of what was once a proud hobby. If Carrie Nation were around today, she would rip 'em up and let the dealers return them to Bash for a refund. Alas, most hams today can't get their wheelchairs into the ham stores...or maneuver their walkers to the book department. Only the frustrated CBers are making it.

As far as I know, only *CQ* is carrying ads for these insidious publications. The FCC can make rules against them, but how can they be enforced? So Bash goes on reprinting the FCC exams virtually word for word, complete with the answers. He started out at FCC offices interviewing people who had just been through the exam, getting everything they could remember and writing it down. Today I think he depends on cards sent in by people who have just taken the exam. It's a sure-fire way of totally destroying the FCC test...and the fabric of amateur radio. These cheat-sheets have been so successful that a large percentage of the ham clubs who had been giving technical classes to prepare people to pass the test have given them up. Why spend the time and money on classes when you can memorize a few test answers in a couple of hours and fly through the exam?

NEWS FLASH

On February 17, the Federal Communications Commission approved the release of a Notice of Proposed Rule Making and Notice of Inquiry that could result in a substantial expansion of the amateur HF phone subbands. The Commissioners propose to expand the present 20-meter allocation by 50 kHz, giving General, Advanced, and Extra Class amateurs phone, SSTV, and facsimile privileges from 14.150 to 14.200 MHz. The docket, which is labeled Private Radio Bureau 82-83, has a comment deadline of July 1, with reply comments due August 2. Along with proposing the 20-meter expansion, the Commissioners are seeking comments regarding the expansion of other US phone allocations. *73* will bring you the full text of PRB 82-83 as soon as it is available.

In turn, this has been keeping newcomers to amateur radio from having to contact the clubs...and has further discouraged club membership. So we are seeing many of our ham clubs dying. Many are becoming geriatric events where doddering old-timers regale each other with tales of long ago triumphs.

If anyone out there really cares about getting amateur radio repaired, if anyone would like to see us be able to provide emergency communications, if you'd like to see us start turning out some new inventions and pioneering new techniques, if you are sick of the crap on our bands...then start *doing* something about it. It is up to *you*. Go down to your ham store and talk the owner into throwing out those Bash books. Tell *CQ* what you think of their carrying the Bash ads. Let's take some steps to make this a technical hobby again. Let's see what we can do to get hams back into building, experimenting, and pioneering.

Let's get our ham contacts more interesting by weeding out the CBers who never grow up. Let's get those technical classes in clubs going again. I want to be proud to be a ham...and so do you.

Carrie Nation...where is your spirit?

THE CD DEBACLE

My editorials on the almost non-existent state of Civil Defense in the United States have apparently fallen upon apathetic and uninterested eyes. I've had virtually no response. Trying to get some life into this desperately needed service is like trying to move the *Queen Mary*.

To go back briefly over the situation: As part of the SALT agreements our politicians, with their usual wisdom and foresight, made a pact with Russia setting up the main nuclear deterrent as Mutual Assured Destruction (MAD). We agreed to not protect our cities and people and Russia made the same pact. Fine idea...if they blast our cities, we'll blast theirs, and no one wins.

As usual with Russian agreements, the first step to implement it was a massive building of nuclear bomb shelters throughout Russia. Well, they've done well with this. If you ever read any news more than the ball scores, you know that the Russian shelter system is an accomplished fact. Perhaps it is time to go back and change MAD to AAD, American Assured Destruction.

It is unlikely that our present government is going to do anything serious to revitalize Civil Defense. They're fighting to cut expenses, not generate them...fighting against the massive social reform expenses. A recent study of Sweden on PBS showed the result of socialism carried to the extreme. Depressing.

Amateur radio has never depended on the government for support. The fact is that in just about every case you can mention, the government has hurt amateur radio when it has meddled with it. Left to our own resources, we would have a much larger amateur radio service, would be years ahead in technology, and our country would not have been passed by

KENWOOD

...pacesetter in amateur radio

R-1000

$30.00 OFF

$ CASH NOW! $

ASK YOUR DEALER FOR DETAILS

TR-7730

$30.00 OFF

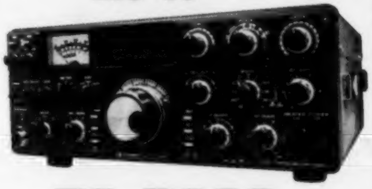
WITH OR WITHOUT MC-46

TS-130SE or TS-130S

$15.00 OFF

TR-8400

$30.00 OFF



TS-530S

$15.00 OFF

Participating Trio-Kenwood Authorized Dealers:

ALABAMA
Long's Electronics
Birmingham, AL 35233
(205) 252-7589
ALASKA
Reliable Electronics
Anchorage, AK 99503
(907) 279-5100
ARIZONA
Power Communications
Phoenix, AZ 85015
(602) 241-9288
CALIFORNIA
Ham Radio Outlet
Burlingame, CA 94010
(415) 342-5757
Ham Radio Outlet
San Diego, CA 92123
(714) 560-4900
Ham Radio Outlet
Van Nuys, CA 91401
(213) 988-2212
Ham Radio Outlet*
Oakland, CA 94609
(415) 451-5757
Ham Radio Outlet
Anaheim, CA 92801
(714) 761-3033
Henry Radio, Inc.
Los Angeles, CA 90025
(213) 820-1234
Henry Radio & Electronics
Anaheim, CA 92801
(714) 772-9200
COLORADO
CW Electronic Sales Co.
Denver, CO 80202
(303) 832-1111
FLORIDA
Amateur Electronic Supply
Orlando, FL 32803
(305) 894-3238
Amateur Radio Center
Miami, FL 33137
(305) 573-8383
HAWAII
Honolulu Electronics
Honolulu, HI 96814
(808) 949-5564
IDAHO
Ross Distributing Co.
Preston, ID 83263
(208) 852-0830
ILLINOIS
Erickson Communications
Chicago, IL 60630
(312) 631-5181
INDIANA
Graham Electronics
Indianapolis, IN 46204
(317) 635-5453
Hoosier Electronics
Terre Haute, IN 47802
(812) 238-1456
Kryder Electronics
Fort Wayne, IN 46815
(219) 485-6434
IOWA
HI, Incorporated
Council Bluffs, IA 51502
(712) 323-0142
KANSAS
Associated Radio Comm.
Overland Park, KS 66204
(913) 381-5901
MARYLAND
Electronic Int'l Service
Wheaton, MD 20902
(301) 946-1088
The Comm. Center
Laurel, MD 20810
(301) 792-0600
MICHIGAN
Radio Supply & Engineering
Detroit, MI 48201
(313) 435-5660
MINNESOTA
Midwest Amateur Radio Supply, Inc.*
Minneapolis, MN 55142
(612) 521-4662
MISSOURI
Ham Radio Center
St. Louis, MO 63132
(314) 993-6060
Henry Radio Company
Butler, MO 64730
(816) 679-3127
MidCom Electronics
St. Louis, MO 63144
(314) 961-9990
Missouri Radio Center*
Kansas City, MO 64150
(816) 741-8118
MONTANA
Conley Radio Supply
Billings, MT 59101
(406) 259-9554
NEBRASKA
Communications Center
Lincoln, NB 68508
(402) 476-7331
NEVADA
Amateur Electronic Supply*
Las Vegas, NV 89106
(702) 647-3114
NEW HAMPSHIRE
Tuft's Radio & Elect. Supply
Hudson, NH 03051
(603) 883-5005
NEW MEXICO
Electronic Module
Hobbs, NM 88240
(505) 397-3022
NEW YORK
Adirondack Radio Supply
Amsterdam, NY 12010
(518) 842-8350
Harrison Radio Corp.
Long Island, NY 11735
(516) 293-7990
Radio World
Oriskany, NY 13424
(315) 736-0184
OHIO
Amateur Electronic Supply
Wickliffe, OH 44092
(216) 585-7388
Srepco Electronics
Dayton, OH 45404
(513) 224-0871
Universal Amateur Radio, Inc.
Reynoldsburg, OH 43068
(614) 866-4267
OKLAHOMA
Derrick Electronics*
Broken Arrow, OK 74012
(918) 251-9923
Radio, Inc.
Tulsa, OK 74119
(918) 587-9123
OREGON
Portland Radio Supply
Portland, OR 97205
(503) 228-8647
PENNSYLVANIA
Hamtronics/Trevose
Trevose, PA 19047
(215) 357-1400
J.R.S. Distributors
York, PA 17404
(717) 854-8624
SOUTH CAROLINA
G.I.S.M.O. Communications
Rockhill, SC 29730
(803) 366-7157
SOUTH DAKOTA
Burghardt Amateur Center
Watertown, SD 57201
(605) 866-7314
TENNESSEE
Amateur Radio Supply of Nashville
Madison, TN 37115
(615) 868-4956
Memphis Amateur Electronics
Memphis, TN 38108
(901) 683-9125
TEXAS
Douglas Electronics
Corpus Christi, TX 78404
(512) 883-5103
Electronics Center
Dallas, TX 75201
(214) 526-2023
Hardin Electronics
Ft. Worth, TX 76112
(817) 429-9761
Madison Electronics
Houston, TX 77010
(713) 658-0268
Kennedy Associates
San Antonio, TX 78222
(512) 333-6110
WASHINGTON
A-B-C Communications
Seattle, WA 98155
(206) 364-8300
Amateur Radio Supply Co.
Seattle, WA 98108
(206) 767-3222
C-COMM*
Seattle, WA 98107
(206) 784-7337
WISCONSIN
Amateur Electronic Supply
Milwaukee, WI 53216
(414) 442-4200

*Interim Dealers

SAVE NOW!

BONU$ BUCK$

This **KENWOOD BONUS BUCKS** coupon, when presented to any factory authorized dealer in TRIO-KENWOOD COMMUNICATIONS products, may be used as partial payment in the amount of $30.00 toward the purchase of any new KENWOOD model R-1000, TR-8400, or TR-7730 with MC-46 or basic UP/DOWN microphone, or may be used as partial payment in the amount of $15.00 toward the purchase of any new KENWOOD model TS-130S, TS-130SE, or TS-530S amateur radio product. The purchase must be made during the period March 1, through June 15, 1982. The customer must present a separate coupon (one only) for each of the listed models being purchased. Additional coupons are available from our authorized dealers. TRIO-KENWOOD assumes no responsibility for the inability of any of its dealers or of itself to deliver any specific product within the period specified in the foregoing. Offer valid only in the U.S.A. Void where taxed or prohibited by law. Resellers are not eligible to participate in this program. This coupon is a part of TRIO-KENWOOD COMMUNICATIONS "BONUS BUCKS" sales program. It has no value unless submitted in compliance with the rules of that program prior to June 15, 1982.

Model Purchased	Date Purchased
	/ /1982

Dealer Name: ______________________________

Customer Name: ______________________ Call Sign: __________

Address: ______________________________

City: ______________________ State/Zip: __________

Customer Signature: ______________________________

KENWOOD
TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut, Compton, California 90220

73 8B/82

Good Mar. 1 through Jun. 15, 1982.

STAFF

PUBLISHER/EDITOR
Wayne Green W2NSD/1

EXECUTIVE VICE PRESIDENT
Sherry Smythe

ASSISTANT PUBLISHER/EDITOR
Jeff DeTray WB8BTH

ASSOCIATE PUBLISHER/DIRECTOR OF PUBLICATIONS
Edward Ferman WA1UFY

MANAGING EDITOR
John Burnett

ASST. MANAGING EDITOR
Susan Philbrick

EDITORIAL ASSISTANTS
Nancy Noyd
Richard Phenix

CONTRIBUTING EDITORS
John Ackermann AG9V
Tim Daniel N8RK
Larry Kahaner WB2NEL

ADMINISTRATIVE ASSISTANT
Pat Graham

ASSOCIATES
Robert Baker WB2GFE
Bill Gosney KE7C
Sanger Green
Dave Ingram K4TWJ
Joe Kasser G3ZCZ
Dr. Marc Leavey WA3AJR
Bill Pasternak WA6ITF
Peter Stark K2OAW

PRODUCTION MANAGER/ PUBLICATIONS
Nancy Salmon

ASST. PRODUCTION MANAGER/PUBLICATIONS
Michael Murphy

ADVERTISING GRAPHICS MANAGERS
Steve Baldwin
Bruce Hedin
Jane Preston

PRODUCTION
Frances Benton
Fiona Davies
Linda Drew
Sandra Dukette
Matthew Hale
Dianne Ritson
Patricia Mackowsky/Allen
Theresa Ostebo
Scott Philbrick
Betty Smith
Deborah Stone
Irene Vail
Judi Wimberly
Donna Wohlfarth
David Wozmak

PHOTOGRAPHY
William Heydolph
Paul Babich
Bryan Hastings
Robert Villeneuve
Thomas Villeneuve

TYPESETTING
Sara Bedell
Debbie Davidson
Beverly Jackson
Elizabeth Lockhart
Anne Rocchio
Kelly Smith
Karen Stewart
Michele DesRochers
Steve Jewett
Lisa Steiner

CONTROLLER
Peter Correia

EXECUTIVE ASSISTANT
Leatrice O'Neil

ACCOUNTING MANAGER
Knud Keller KV4GG/1

CIRCULATION MANAGER
Debra Boudrieau

CIRCULATION
Doris Day
603-924-9471
Pauline Johnstone

BULK SALES MANAGER
Ginnie Boudrieau

ADVERTISING
603-924-7138
Jim Gray W1XU, Mgr.
Nancy Ciampa, Asst. Mgr.
Ross Kenyon KA1GAV
Cornelia Taylor

Japan and possibly Russia in technology.

With amateur radio the only practical system for emergency communications, one might think that the government would be interested and perhaps even cooperative. But no, CD is a disaster in most areas of the country. Few CD officials have wanted to cooperate with amateurs, so there isn't much doing as far as organized CD communications is concerned. This has not stopped the CD officials from spending all of the money allocated to their areas, even though most, if not all, of the money is wasted.

We can bring some light into this dark area if readers with personal knowledge of what is happening in their communities will write and let me know. Let's bring this out into the open and see if we can't get some official pressure to improve the situation.

With or without CD cooperation, I'd like to see amateurs set up a national emergency communications system...one which would provide the communications which will be needed in case of the worst. Remember, if we don't have such a system set up and working on a daily basis when there is no emergency, it is not likely to be of much value when things are in an uproar.

With some guidance and leadership, we might be able to get many ham clubs to establish special emergency teams. We'll be wanting to provide communications not only between hams, but also have a system of communicating with most of the other civilian and governmental radio services. This will mean the establishing of emergency communications centers with their own power and equipment capable of operating on a wide range of frequencies.

If any clubs are doing this, we'd like to have some pictures and an article. This might encourage other groups to work along similar lines.

Or would you rather just ragchew and wait, hoping that the Russians will feel sorry for our unprotected cities and be nice enough not to take advantage?

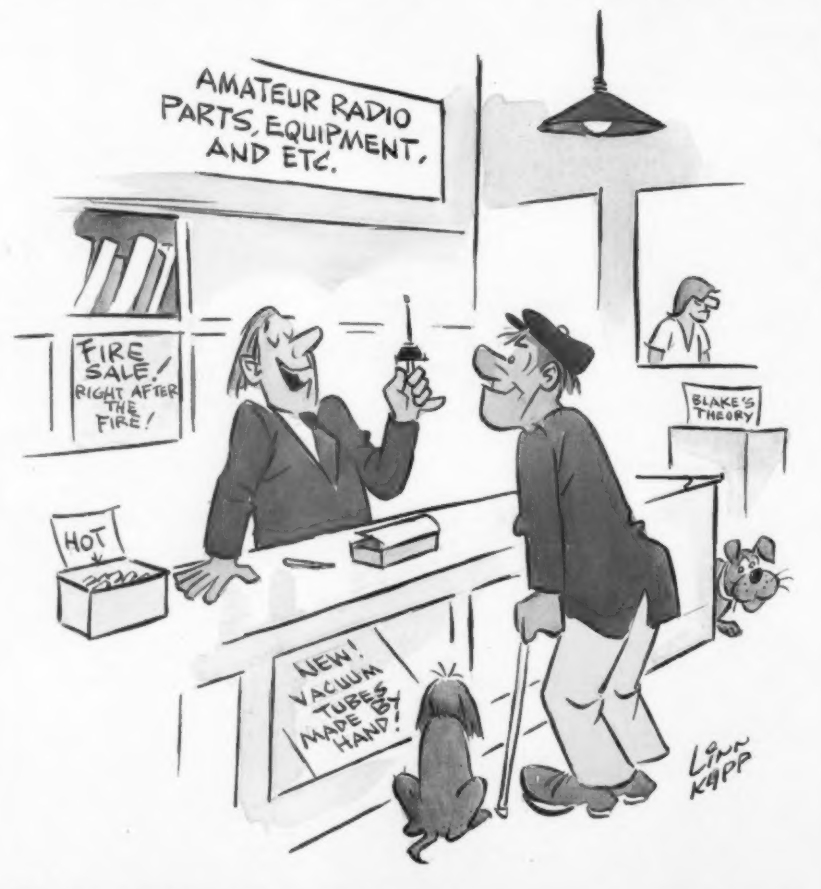
KILLING THE WOODPECKER

Yes, the damned thing is a pain. And it isn't going to go away unless *you* do something about it. We already know what it is. We know where it is. We know

Continued on page 44

Well . . . I Can Dream, Can't I?

by Bandel Linn K4PP


AMATEUR RADIO
PARTS, EQUIPMENT, AND ETC.
FIRE SALE! RIGHT AFTER THE FIRE!
HOT
BLAKE'S THEORY
NEW! VACUUM TUBES MADE BY HAND!
LINN K4PP

"It's the greatest thing to come along in engineering! Here—for two dollars—is a 160-meter antenna . . . six inches long!"

New Drake TR5 Transceiver

TR5 TRANSCEIVER
DRAKE
BAND
ABC
MODE
RIT
PWR OFF

far above average!

COMING SOON:
RV75 Synthesized VFO
featuring the Drake "VRTO"

• **Frequency Synthesized** for crystal-controlled stability • **VRTO (Variable Rate Tuning Oscillator*)** adjusts tuning rate as function of tuning speed. • **Resolution to 10 Hz** • **Three programmable fixed frequencies** for MARS, etc. • **Split or Transceive** operation with main transceiver PTO or RV75

* Patent pending

With the new TR5
versatility and value are spelled D-R-A-K-E . . .

DYNAMIC RANGE	The dynamic range of the TR5 is unexcelled by any transceiver in its class. The TR5's greater than 0 dBm third order intercept point (85 dB two-tone dynamic range) at 20 kHz spacing can be achieved only by the use of a passive diode-ring double balanced mixer. Drake was the first to bring this technology to the Amateur market with a high-level mixer in the TR7.
RELIABLE SERVICE	When you purchase a TR5, or any Drake product, you acquire a product of the latest production techniques, which provide reliable performance. Yet with a product as sophisticated as one of today's transceivers, after-sales service is a must. Ask any Drake owner. Our Customer Service Department has a reputation second to none.
ACCESSORIES	Drake is the only Amateur Radio manufacturer who offers a full complement of accessories to satisfy almost every desire the HF Amateur may have. This wide selection allows any operator to assemble a station which meets his needs, and assures compatible interfacing and styling instead of a desk full of equipment with a variety of styling and poor operation as a system.
KILOWATT AMPLIFIER	Everyone wants to be heard! The accessory L75 and its 3-500Z (1200 watts PEP input) and a decent antenna will do the trick. This rugged self-contained amplifier / power supply will put the TR5 on an even footing with the best of them.
ENGINEERING	The TR5 and all Drake Transceivers, are backed by the best in engineering. The TR5 is the result of an extensive engineering effort, combining proven past techniques and ideas with new state of the art concepts. As a result, the TR5 will not be superceded by a new model every six months. It represents a true radio communications value that will provide many years of operating enjoyment.

Features, availability and prices subject to change without notice or obligation.

See your Drake dealer
or write for
additional information.

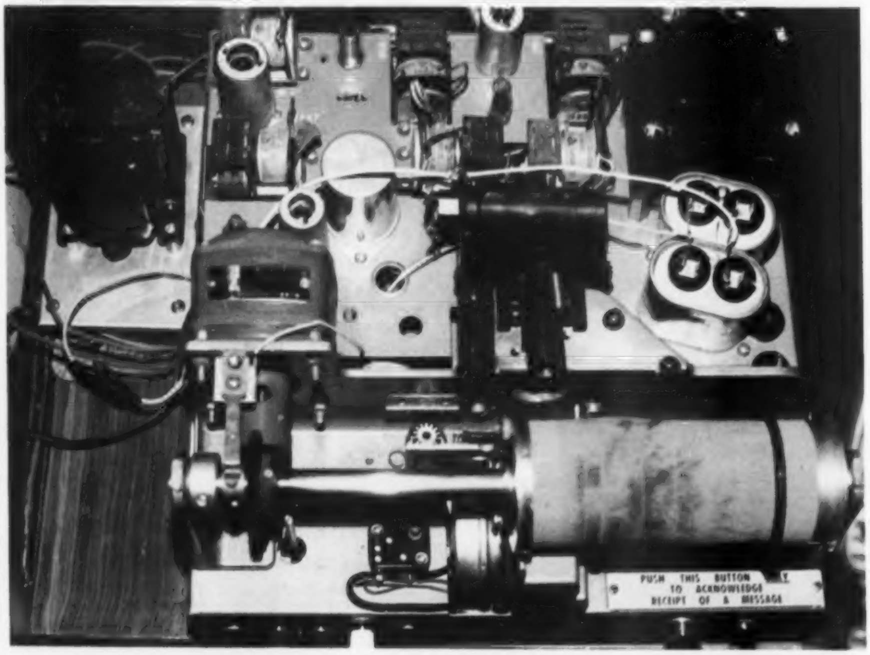
R. L. DRAKE COMPANY DRAKE

540 Richard St., Miamisburg, Ohio 45342, USA
Phone: (513) 866-2421 • Telex: 288-017

Al Cikas KA9GDL
2112 Stonehenge
Springfield IL 62702

Watching the Weather

—a cheap and easy conversion



The converted fax unit. The autotransformer is to the left of the deskfax. The motor capacitors are shown between the drum and the power transformer occupying the area formerly used for the exciter lamp.

The Western Union deskfax offers an inexpensive approach to the reception of satellite cloud-cover pictures. This article describes a complete satellite receive system using the deskfax recorder. Little actual construction is necessary and the results can be equal to those of more complicated systems. The receive system and the fax display unit are separate elements and are discussed individually.

Receiver Conversion

The receiver needed here should be capable of FM reception somewhere between 20 and 50 MHz and should be tunable in order to compensate for Doppler shift. A receiving converter is used to bring the satellite frequencies within range of the FM receiver. Several radio sets which qualify are listed in Table 1.

All of the receivers mentioned in Table 1 sell for less than $35 and one of these or a similar receiver should be obtained first. Then it is a matter of selecting a converter with an output which falls within the tuning range of the receiver. The converter crystal determines this output frequency.

One attractive prospect is the use of a converter which reduces the incoming signal by exactly 100 MHz. A satellite signal transmitted at 137.45 MHz is thus converted to 37.45 MHz and the digit one is mentally added to the front of the receiver dial. However, it should be noted that receivers which cover 28-39 MHz usually sell for about ten dollars more than those which tune 20-28 MHz. In this case, the frequency conversion should be increased to 115 MHz for an output of 22 MHz. The converter should not change the satellite signals in such a manner that would permit interference from Citizens Band transmitters. That is, a frequency difference of 110 MHz should be avoided.

I use an R-108 military surplus receiver and a converter purchased from Hamtronics Co. The receiver is more sensitive than its BC-603 counterpart, but it requires a filament supply of 6 V dc at 6 Amperes as well as a 135-V dc B-plus supply. The R-108 does have some nice features to make it a worthwhile purchase. One is a fixed level of audio output that is independent of the speaker volume control. The fixed output can be fed directly to the deskfax recorder. A tuning aid in the form of an oscillator is also included.

A simple turnstile antenna, consisting of two crossed dipoles with reflectors, was made from a wooden mast and some ¼-inch aluminum tubing. RG-59 was used as feedline. This antenna provides excellent signals and good pictures can be obtained on overhead passes. Once the satellites have been heard, the orbit calculations are quite simple.

The Deskfax conversion system described in the text is pictured here. Although the deskfax is shown with the top cover in place, it is better to have the cover removed for actual use. The picture also shows the FM receiver and the converter, preamp, and power supply for the solid-state circuits.

Some simple DXing and notetaking will reveal enough information for short-term predictions of the next satellite pass. Commercially-available satellite-tracking kits such as the one the ARRL provides for the OSCAR satellites are helpful in the initial efforts to understand orbital mechanics and the unusual behavior it imparts to satellite paths.

Picture Display

The deskfax conversion is almost as simple as the receiving system. The deskfax unit is used essentially as is, with only minor modifications made for convenience. Since no type of transmission is desired in this unit, some of the transmit circuitry is disabled or removed.

Once the deskfax unit is obtained, a few operational checks should be made. The first check is to see that the unit functions when the incoming and outgoing buttons are pressed. It should be noted which of the relays operate in each mode, paying attention to the incoming function.

A relay marked LR, located near the back of the unit, must be operated manually as the incoming switch is pressed. A rubber band stretched around the LR contact wafer and attached to the 6AU6 tube, located between relays TR and ACK, provides a conve-

Radio Set	Type	Frequency Coverage	Notes
BC-603	military surplus	20-28 MHz	sold w/o power supply
R-108	military surplus	20-28 MHz	sold w/o power supply
BC-683	military surplus	28-39 MHz	sold w/o power supply
R-109	military surplus	28-39 MHz	sold w/o power supply
Radio Shack VHF Pro	police band	30-50 MHz	solid state, power supply included

Table 1. Possible radios for receiver conversion.

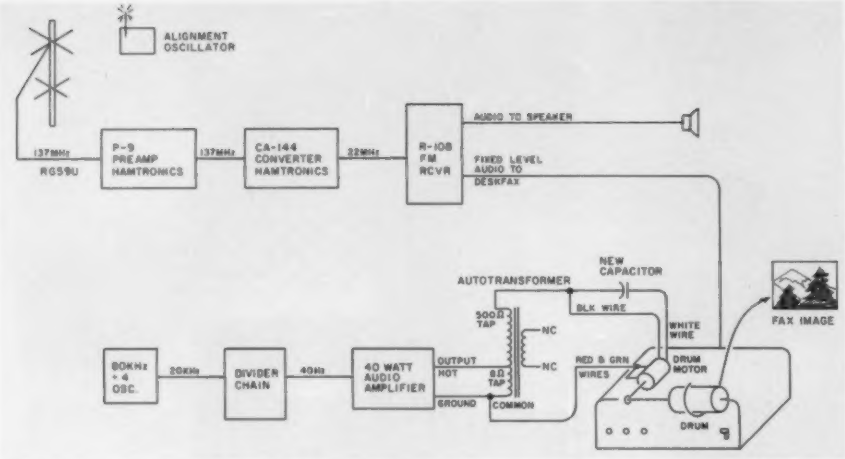

ALIGNMENT OSCILLATOR
137MHz
RG59U
P-9 PREAMP HAMTRONICS
137MHz
CA-144 CONVERTER HAMTRONICS
22MHz
R-108 FM RCVR
AUDIO TO SPEAKER
FIXED LEVEL AUDIO TO DESKFAX
AUTOTRANSFORMER
NEW CAPACITOR
BLK WIRE
500Ω TAP
NC
NC
WHITE WIRE
FAX IMAGE
80KHz ÷ 4 OSC.
20KHz
DIVIDER CHAIN
40Hz
40 WATT AUDIO AMPLIFIER
OUTPUT HOT
8Ω TAP
GROUND
COMMON
RED & GRN WIRES
DRUM MOTOR
DRUM

Fig. 1. Block diagram of the complete fax system.

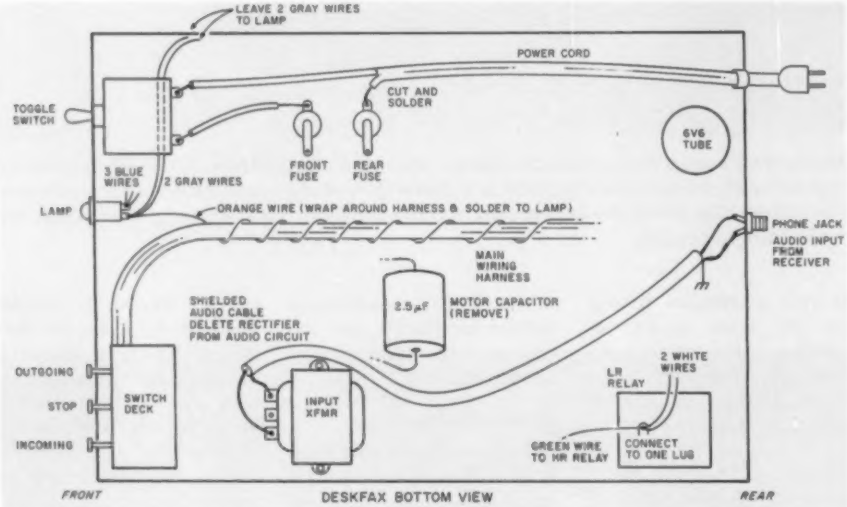

LEAVE 2 GRAY WIRES TO LAMP
POWER CORD
CUT AND SOLDER
TOGGLE SWITCH
FRONT FUSE
REAR FUSE
6V6 TUBE
3 BLUE WIRES
2 GRAY WIRES
LAMP
ORANGE WIRE (WRAP AROUND HARNESS & SOLDER TO LAMP)
PHONE JACK
AUDIO INPUT FROM RECEIVER
MAIN WIRING HARNESS
SHIELDED AUDIO CABLE DELETE RECTIFIER FROM AUDIO CIRCUIT
2.5µF
MOTOR CAPACITOR (REMOVE)
OUTGOING
STOP
INCOMING
SWITCH DECK
INPUT XFMR
LR RELAY
2 WHITE WIRES
GREEN WIRE TO HR RELAY
CONNECT TO ONE LUG
FRONT
DESKFAX BOTTOM VIEW
REAR

Fig. 2. A few simple wiring changes are needed to modify a deskfax unit.

nient way to anchor this relay into operation. Now relay PWR should close, and the 6V6 tube will start to glow. As the 6V6 tube warms up, a number 47 lamp in the B-plus power supply will also start to glow, dimly. The relay marked HR will close and the rotating drum will start to advance toward the opposite end of the fax machine. At the end of the drum's travel, a screw located on the forward end of the drum touches a post which shuts off the incoming switch deck, resets the relays, and allows the drum spring to return the drum to its original position.

If all this occurs, the unit is probably OK. If the 6V6 or HR relay fail to operate, check the cathode and plate voltages on the 6V6. The cathode should have 16-20 V dc and the plate should have 280-300 V dc. Failure to read these voltages indicates that one of the larger resistors in the deskfax is opened. The grid voltage on this tube is practically nil.

To the rear of the drum is the stylus arm. A small aluminum clip containing a steel wire stylus fastens to this arm. The incoming check should be repeated again, this time to verify operation of the stylus. With a piece of fax paper on the drum, begin the testing procedure again. At the rear of the deskfax, between relays LR and ACK, there is a pot listed as P1. After the drum starts moving, P1 should be advanced until the stylus begins to burn the fax paper. If the fax paper does not burn, try placing an audio signal across the end taps of the transformer located near the incoming switch deck. The fax paper will burn according to the intensity of the audio signal.

A new stylus, if needed, can be made from a steel wire cut from a wire brush or a wire wheel. It is not necessary to solder the new wire to the old stylus clip; merely route the new wire though the holes that are in the clip, then install it in the holder. Using this method, it is possible to attach a 2-inch-long wire and extract it toward the drum as it burns down. In this way, the stylus need not be changed so often.

Now the deskfax is ready for conversion. First, remove the wires that are connected to the coil of LR. Remove the buzzer and the ACK push-button switch. The orange wire which follows the switch deck harness should be attached to the ACK lamp and the jumper from the push-button to the lamp should be deleted. The short gray wire should also be removed. The ACK lamp will now have one side connected to 3 blue wires and the other side will have 2 gray wires and 1 orange wire. The ACK lamp will not light. A toggle switch should be attached where the push-button was mounted. Unsolder the power cord and move it farther into the chassis until one wire will reach the new toggle switch. Then solder that wire to one side of the switch. Trace the remaining wire back to the rear power fuse. Cut the wire there and solder it to the empty terminal on the rear fuseholder. Using the piece of power cord that was just cut off, connect the empty terminal of the front fuseholder to the remaining terminal of the toggle switch. This will complete the wiring of the main power switch.

Remove the exciter lamp assembly and its transformer. If you do not desire to manually operate relay LR, it may be left on permanently by soldering the contacts together or jump-

Reader Service for facing page ↗303→

HEATH AND HAMS...

"PERFECT PARTNERS"

Who builds the best Amateur Radio gear around? *You do!* Thousands of Hams attest to the reliable performance, specifications and long-term dependability of Heathkit Amateur equipment. Not to mention the thrill of airing a rig that you've built with your own hands. The more than 200 Hams at Heath invite you to join the fun.

For over three decades, our unique *"We won't let you fail"* philosophy has created a strong partnership between Hams and Heath, the world's leading electronic kit manufacturer. Heath is committed to designing equipment and accessories of the highest quality that will withstand the test of performance – QSO after QSO.

Amateur Radio is an exciting, worthwhile hobby. Starting and pursuing it with Heathkit equipment is the best way to go. Our complete line can provide everything you need, from a basic Code Practice Oscillator and self-study License Courses all the way to a sophisticated station of operation with remote capability. Pacesetter Amateur Radio enthusiasts are even using Heath/Zenith computers to design antennas, plot beam headings, track OSCAR and transmit RTTY. Heath and Hams, once again, are *"perfect partners"* in a new adventure.

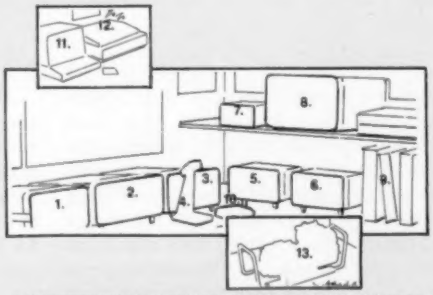
See the complete Amateur Radio line in our latest catalog or visit your nearby Heathkit Electronic Center*

Where Heathkit products are displayed, sold and serviced. See your telephone directory white pages for the store near you.

*Heath Company and Veritechnology Electronics Corporation are wholly-owned subsidiaries of Zenith Radio Corporation. The Heathkit Electronic Centers are operated by Veritechnology Electronics Corporation.

Heathkit®

There's more for the Ham at Heath



A HEATHKIT 'TOP-OF-THE-LINE' STATION: 1. SB-644A Remote VFO **2.** SB-104A HF Transceiver **3.** SB-604/PS-1144 SSB Speaker and Power Supply **4.** HDP-242 VOX/PTT Cardioid Desk Mike **5.** SB-634 Five-Function Station Console **6.** SB-614 CRT Station Monitor **7.** HM-2140 Dual HF Wattmeter **8.** SB-221 2kW Linear Amplifier **9.** Guaranteed Self-study Courses for Novice, General and Advanced Class Licensing **10.** SA-5010 μMatic Memory Keyer **11.** H-89 All-In-One Computer Terminal **12.** H-25 High-Speed Dot Matrix Line Printer **13.** GU-1820 emergency/remote Portable Power System

FREE CATALOG: Send for your free copy of the latest, colorful 104-page Heathkit Catalog by writing: Heath Company, Dept. 011-884 Benton Harbor, MI 49022. In Canada contact Heath Co., 1480 Dundas Street E., Mississauga, ONT L4X 2R7.

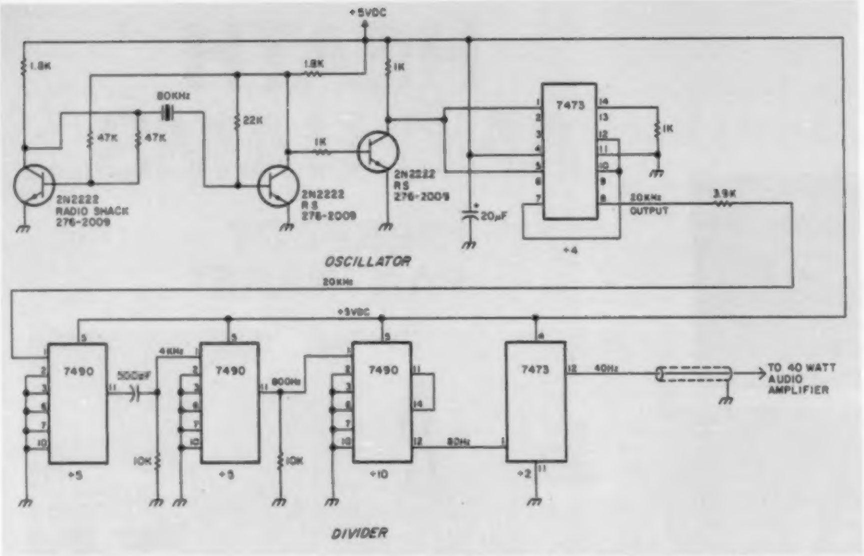

+5VDC
1.8K
1.8K
1K
80KHz
47K
47K
22K
1K
2N2222
RADIO SHACK
276-2009
2N2222
RS
276-2009
2N2222
RS
276-2009
20µF
7473
1K
20KHz
OUTPUT
3.9K
÷4
OSCILLATOR
20KHz
+5VDC
7490
500pF
4KHz
7490
800Hz
7490
7473
40Hz
TO 40 WATT
AUDIO
AMPLIFIER
10K
10K
80Hz
÷5
÷5
÷10
÷2
DIVIDER

Fig. 3. This 40-Hertz signal source drives an audio amplifier which powers the deskfax drum motor.

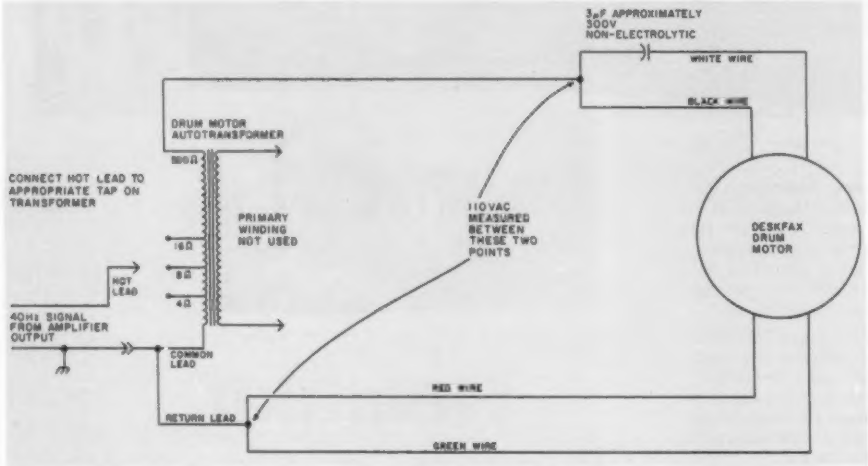

3µF APPROXIMATELY
300V
NON-ELECTROLYTIC
WHITE WIRE
BLACK WIRE
DRUM MOTOR
AUTOTRANSFORMER
500Ω
CONNECT HOT LEAD TO
APPROPRIATE TAP ON
TRANSFORMER
PRIMARY
WINDING
NOT USED
110VAC
MEASURED
BETWEEN
THESE TWO
POINTS
DESKFAX
DRUM
MOTOR
16Ω
8Ω
4Ω
HOT
LEAD
40Hz SIGNAL
FROM AMPLIFIER
OUTPUT
COMMON
LEAD
RED WIRE
RETURN LEAD
GREEN WIRE

Fig. 4. The 40-Hertz signal from the amplifier is stepped up to run the motor. A dc voltmeter placed at the output of the amplifier will read approximately 12 volts going into the autotransformer. A lower voltage indicates the amplifier does not have sufficient output power to drive the motor.

ering them. The unshielded leads of the input line leading to the input transformer should be replaced with shielded audio wire. The original wire exited through a hole in the rear of the chassis. This hole will accommodate a phone jack very nicely.

Up to now the conversion steps described have been for the sake of convenience and could be bypassed if desired. But the final step is a must. There are four wires that lead from the gray drum motor located at the top of the fax machine. Trace these wires as far back from the motor as possible, then clip them loose. This should only be done *after* the fax machine checks out completely. The white wire will attach to a 2.5-µF capacitor located below the exciter lamp transformer and this capacitor should also be removed.

Originally the drum motor turned the drum at 180 rpm; this will not synchronize with any 120-rpm fax signals presently used on the satellite bands. In order to minimize the cost and complexity of fax systems, a plan was long ago devised which makes use of the existing motor by altering the frequency at which the motor operates. This is accomplished by replacing the 60-Hertz line voltage with one operating at 40 Hertz. This system is by no means new, but few details have ever been published on how to go about it. This approach becomes more desirable when fax units which operate at 120 rpm are priced.

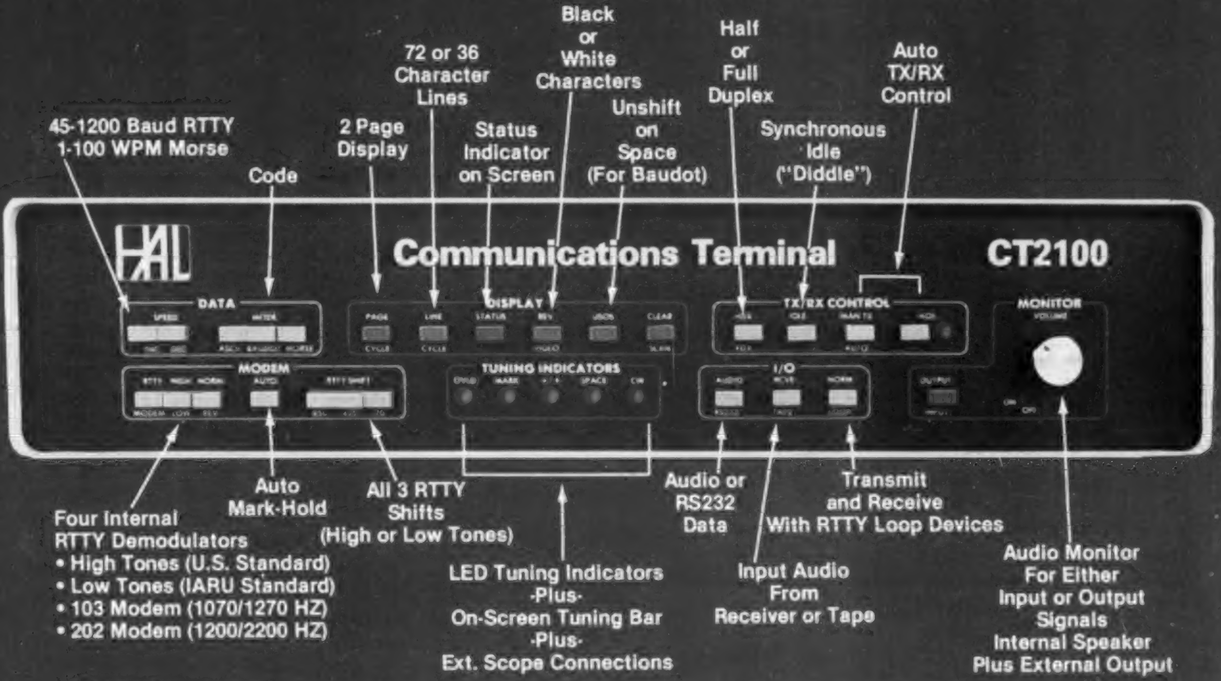
My circuit consists of an oscillator and a divider chain which together produce a 40-Hertz square-wave output which is fed to an audio amplifier, where the signal is coupled to the drum motor through an autotransformer. A square wave is necessary for the divider chain to function properly.

The oscillator circuit was originally designed by Ken Cornell as part of a transmitter for the license-free 1750-meter band and was first published in the newsletter of the Longwave Club of America. It is with Ken's kind permission that the modified circuit is included here. The circuit was selected for its stable square-wave output. The oscillator and the divider chain both operate from a five-volt power supply. The Cornell circuit makes use of a crystal operating at 80 kHz and divides the signal down to the 20 kHz the divider chain requires. Since the oscillator circuit was designed for a much higher crystal frequency, it may take a few seconds warmup time to get the oscillator perking. A suitable substitute for Ken's design would be an oscillator operating at 100 kHz, divided by 5. Only the 80-kHz crystal and 7473 IC chip need to be changed. This should be considered if a 100-kHz crystal is more readily available.

The divider chain consists of a few components and a handful of ICs. The frequency divisions may be verified by monitoring the outputs of each IC. The 40-Hertz output is then fed to an audio amplifier. I used a tape recorder am-

CT2100

HAL Puts MORE Behind The Buttons


45-1200 Baud RTTY
1-100 WPM Morse
Code
2 Page Display
72 or 36 Character Lines
Status Indicator on Screen
Black or White Characters
Unshift on Space (For Baudot)
Half or Full Duplex
Synchronous Idle ("Diddle")
Auto TX/RX Control
Communications Terminal
CT2100
DATA
DISPLAY
TX/RX CONTROL
MONITOR
MODEM
TUNING INDICATORS
I/O
Four Internal RTTY Demodulators
• High Tones (U.S. Standard)
• Low Tones (IARU Standard)
• 103 Modem (1070/1270 HZ)
• 202 Modem (1200/2200 HZ)
Auto Mark-Hold
All 3 RTTY Shifts (High or Low Tones)
LED Tuning Indicators -Plus- On-Screen Tuning Bar -Plus- Ext. Scope Connections
Audio or RS232 Data
Transmit and Receive With RTTY Loop Devices
Input Audio From Receiver or Tape
Audio Monitor For Either Input or Output Signals Internal Speaker Plus External Output

CT2100 System:

- CT2100 Communications Terminal
- KB2100 Keyboard
- Video Monitor
- Printer (300Bd Serial ASCII-MPI-88G)
- RM2100 Rack Adapter
- MSG2100 2000 Character "Brag Tape" ROM

- 24 Line Display
- 2 Pages of 72 Character Lines
  -or-
  4 Pages of 36 Character Lines
- Split Screen (with KB2100)

Communications Terminal
CT2100
CT2100
KB2100
9" TV Monitor
KB2100

345

HAL COMMUNICATIONS CORP.
Box 365
Urbana, Illinois 61801
217-367-7373

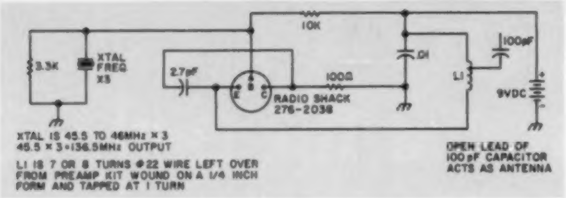

10K
3.3K
XTAL
FREQ
X3
2.7pF
E
B
C
100Ω
RADIO SHACK
276-2038
.01
L1
100pF
9VDC
XTAL IS 45.5 TO 46MHz × 3
45.5 × 3=136.5MHz OUTPUT
L1 IS 7 OR 8 TURNS #22 WIRE LEFT OVER FROM PREAMP KIT WOUND ON A 1/4 INCH FORM AND TAPPED AT 1 TURN
OPEN LEAD OF 100pF CAPACITOR ACTS AS ANTENNA

Fig. 5. You will need a signal source for 136.5 MHz to align your receiver. This simple circuit will do the trick.

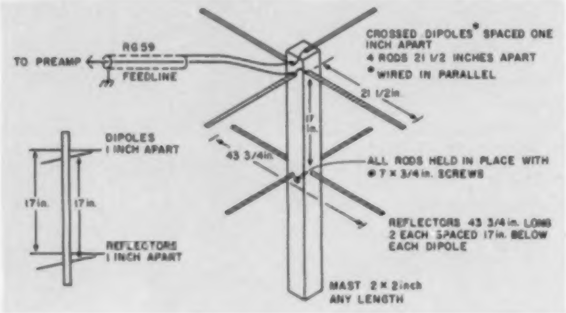

TO PREAMP
RG59
FEEDLINE
CROSSED DIPOLES* SPACED ONE INCH APART
4 RODS 21 1/2 INCHES APART
*WIRED IN PARALLEL
21 1/2in.
17 in.
43 3/4in.
ALL RODS HELD IN PLACE WITH #7 × 3/4in. SCREWS
REFLECTORS 43 3/4in. LONG 2 EACH SPACED 17in. BELOW EACH DIPOLE
MAST 2 × 2inch ANY LENGTH
DIPOLES 1 INCH APART
17in.
17in.
REFLECTORS 1 INCH APART

Fig. 6. The turnstile antenna is a proven performer for satellite reception. You can build one in a few minutes.

plifier, but any good quality amplifier capable of delivering 35-40 Watts may be used. Once the 40-Hertz signal can be confirmed coming out the amplifier's speaker output, the speaker can be disconnected and the motor can be attached.

The trickiest part of this project is to get the deskfax motor to operate from the amplified 40-Hertz signal. The best way to couple the amplifier to the motor is through the use of an autotransformer made by simply using the secondary of a tube-type output transformer having taps for 4, 8, 16, and 500 Ohms. The specifications on the primary winding are not critical, as it is not used. The transformer that I used was a Chicago Standard model A3303. The transformer used should be rated for the power requirements of the rather hefty drum motor. The connection I used is shown in the schematic. The tape recorder used had a 16-Ohm output, so the transformer was fed at the 16-Ohm tap. The motor is powered on one side by the 500-Ohm tap and on the other by the common lead. The 2.5-μF capacitor originally used for the drum motor must be replaced with one of slightly larger value. This is determined by trial and error. Once the drum motor will turn at 120 rpm with at least 100 volts measured across it, then it can be assumed the right capacitive value has been reached. The amplifier should be turned up all the way to power the motor. To stop the drum rotation, simply turn down the volume control or switch off the oscillator.

Cloud cover over Cuba can be seen in this picture provided by Ray Rast W9ERC, who has used this deskfax conversion for four years.

Frequency	Spacecraft	Country
137.15 MHz	Meteor	USSR
137.3 MHz	Meteor	USSR
137.4 MHz	Meteor 36	USSR
137.5 MHz	NOAA 6	USA
137.6 MHz	NOAA 7	USA

Table 2. Weather satellite frequencies (information current as of fall, 1981).

Using the Deskfax System

The deskfax system should now be ready to produce images from the satellites in polar orbit around the Earth. By now it will be noticed that use of the deskfax produces a small wisp of smoke with a charcoal or cap-pistol odor. This smoke can be dispersed with a small fan or removed with the household vacuum cleaner.

This particular system functions very well when receiving picture signals from Russian satellites. The Russian weather satellites give a single picture, whereas American satellites compress two images into one transmission. All satellites transmit some sort of gray scale. The Russian birds seem to incorporate a binary orbit timer which is printed alongside the gray scale. Apparently, this timing mark display is used to determine what part of the orbit has been reached after the equatorial crossing, in case clouds cover the identifiable land features.

If the satellite is heard in a descending pass, that is, one which is traveling toward the equator, the strip of pictures produced by the deskfax system will be right-side-up when taped together. If the orbit is ascending to the polar regions, the picture strip must be inverted for north to be at the top. A typical pass will yield three or four separate fax images which, when placed together end to end, will show the area the satellite traveled over on that pass. An inker mounted on the deskfax will mark the leading edge of the fax paper to note where the image starts.

When each sheet of fax paper is placed in the final strip, be sure to allow about ½ inch between them to account for the time the deskfax was not recording the image. If a stable tape recorder can be found, the image may be preserved entirely by keeping the tape rolling while the fax paper is being changed. However, the common result is that the tape-recorded signals do not deliver the same quality as the live signals coming directly from the receiver. Also, the amount of details lost while changing paper is so small that it is a waste of effort to replay the pass from a tape. Most cloud-system images are far larger than one sheet of fax paper and can be easily visible even with a gap in the picture strip.

With the deskfax system now operational, it is time to consider a few of the finer points of its use. Table 2 shows what VHF frequencies are likely to be used and by which spacecraft.

Bear in mind that as satellites end their useful lifetime, a replacement is usually launched and may operate on or near the same frequency.

Most weather satellites now in orbit use a drum rate of 120 rpm in order to reproduce pictures. Should this standard change, and it is unlikely, the deskfax system can be modified by altering the crystal oscillator frequency and, if necessary, the divider chain. Although the synchronous satellites can show larger areas of the Earth, they cannot sample most of the Earth's weather vertically with sensors as the polar satellites can. The polar satellites can also perform this task frequently. Since several dozen countries have built equipment to receive this type of signal and use it regularly, it is a safe assumption that the polar orbiters are here to stay!

One of the more difficult devices to locate is a signal generator capable of placing a reliable signal near the satellite band. Included in the schematics is a diagram of a simple test oscillator which can be invaluable when aligning the VHF converter and preamp. A popular trick makes use of a roll of foil. Simply insert the oscillator into the roll to adjust for weaker signals. This oscillator can also be used to set the gamma match on directional antennas by placing it on an obliging neighbor's roof a few houses away. Tune the signal on the rig, then run a long speaker lead up to the antenna and tune the antenna for the best performance.

If the deskfax system has one impairment, it is that the images produced from it are negatively polarized. The clouds come out black and the land is white. But this can be remedied with a camera and a close-up lens. I use the following procedure: The fax paper images are photographed on ordinary black-and-white film. Special instructions are given at the drugstore that the film is to be developed but no prints are to be made. The film is to be made into slides instead. When the slides come back they are shown on the projection screen and are technically correct. Cost of developing the film is about two dollars a roll.

Most users of the deskfax system elect to view their images just as they come off the drum. An almost indispensable tool useful in evaluating the weather photos is a map of the United States and Canada printed on a scale of one inch equal to 190 miles. With such a map, the fax strips from the Russian satellites are oriented for easy land mass identification. Often a coastline or river is all that is needed to determine what area of the globe is being looked at. Areas like Cape Cod or Baja as well as states such as Florida and Michigan stand out well, but other areas depend on finer details in the pictures. Once it is well in mind the magnitude of scale the pictures represent, the geography reveals itself easily. Then ice flows can be monitored and tropical storms and hurricanes can be detected.

With five active satellites in orbit, at least a dozen passes a day can be monitored. Sometimes two or three passes occur over the same land mass only minutes or hours apart. In this case, cloud movements can be registered. Where side-by-side coverage can be found, a more complete view of larger cloud systems can be realized. The deskfax unit may also be used on the HF bands for reception of conventional fax transmissions.

A HAM FIRST...

The FIST FIGHTER™

- Send Perfectly-Timed Code
- Perfect 1:3 dot:dash ratio all the time
- Normal key-down tune-up, no switch needed
- Exclusively for straight keys
- Side-tone Oscillator
- Uses CMOS Digital Circuits
- Grid or direct keying
- 3 to 30+ WPM

Assembled and Tested	79.95
Kit	59.95
Shipping and Handling	2.50

VISA and MasterCard accepted.
Virginia residents add 4% sales tax.

Blacksburg Group
Box 242
Blacksburg, Virginia 24060
703/951-9030

✓118

The author wishes to convey special thanks to Ray Rast W9ERC for the information he provided and for demonstrating how simple a satellite fax system can be.■

References

1. "Global Weather Satellites: Two decades of Accomplishment," *Space World Magazine*, November, 1979.
2. "Telefax Transceiver Conversion," *Ham Radio Magazine*, April, 1974, page 16, schematic of deskfax.
3. "Updated Divide-by-4 1750-Meter Transmitter," *The Lowdown*, LWCA Newsletter, March, 1980, page 12.
4. *Tiros N/NOAA User's Guide*, NOAA Tech Memorandum Ness 95.
5. *Space Technology*, Kenneth Gatland, Harmony Books, $24.95.

Where To Buy It

The deskfax recorder may be purchased from Atlantic Surplus Sales, 3730 Nautilus Avenue, Brooklyn, New York 11224. They also sell fax paper and the technical manual for the deskfax.

The receiving converter used by the author came from Hamtronics, 65C Moul Road, Hilton, New York 14468. Be sure to also order the VHF preamp, as it is a must for good picture reception.

Some of the FM surplus receivers mentioned can be ordered from Fair Radio, 1016 East Eureka, Lima, Ohio 45802.

Parts for the oscillator and divider chain can be found at Radio Shack. The entire system shown here can be built for about $300.00.

Dennis W. Phillips KA4RUL
3901 Ibis Drive
Orlando FL 32803

The Sinkhole That Ate Winter Park

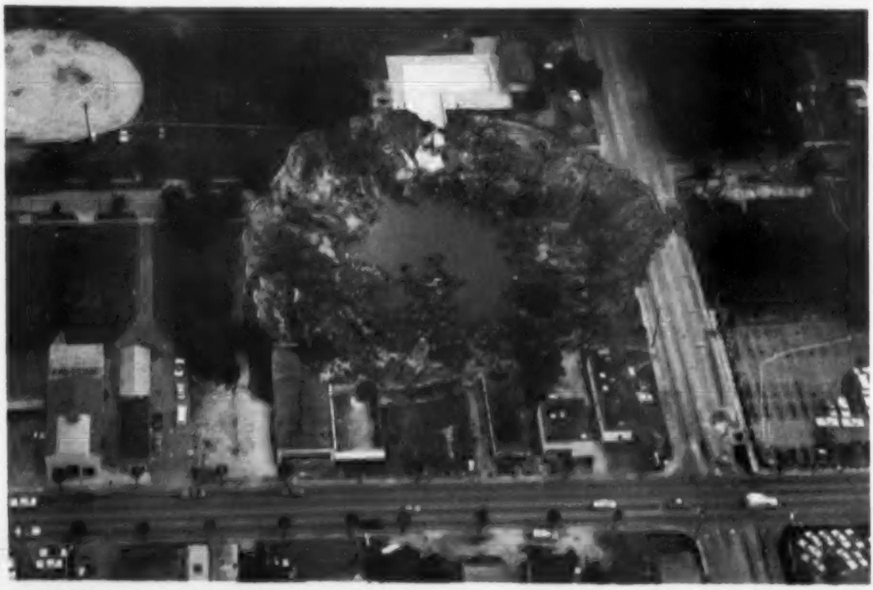
—hams vs. hole

When I locked the door to my business on the afternoon of Friday May 8, 1981, looking forward to a weekend of relaxation, I did not know that within 48 hours my faith in terra firma would be shaken forever and that my faith in the value of amateur radio would be renewed.

Winter Park is just across the city line from Orlando and right in the center of the state of Florida. The area is noted for the many lakes which dot the landscape. These lakes are fed from the massive Florida aquifer, a spongy, water-soaked limestone bed that lies under the whole central area of Florida. During times of drought, the water level falls and the porous rock can collapse. When this happens on a large scale, the resultant depression is called a sinkhole. It appears to be a monstrous crater to the center of the Earth which is devouring its surroundings. It is both frightening and, when occurring in an urban area, dangerous and disastrous.

Early Saturday morning, I was behind my lawnmower enjoying the Fruits of Suburban Living, the Right to Life, Liberty, and the Pursuit of Crabgrass, when the ringing telephone offered a respite from the sun. It was an employee of mine, calling to find out if I knew anything about my shop's condition. She had heard that the area was sinking.

I called the police immediately, but they had no information to give me other than the fact that there was a sinkhole; they advised me to stay away. That same information was confirmed by a call to the Fire Department. I frantically called City Hall—no answer. Then a thought flashed in my mind and I raced to the shack, flipped on the 2-meter rig, and dialed up the local repeater. I called for a break, and there on frequency and at the sinkhole was a ham friend, Ed Cox W0RAO/4. He had just happened to be passing, noticed the emergency vehicles, and stopped for a look! Ed described the activities and area of involvement and then advised me on the best way to get into the area.



Armed with this information, I raced over from my home for an inspection. The area looked like a scene from a B horror movie. Fairbanks Avenue, normally the main east-west road through the town, had a six-block section barricaded. Many emergency vehicles skirted the perimeter. Police had established a crowd-control line. And there in front of the widened eyes of hundreds of spectators was a gaping cra-

Reader Service for facing page ✓15→

At Last.

A microthin, synthesized, programmable, sub-audible tone encoder that fits inside the ICOM IC-2AT.

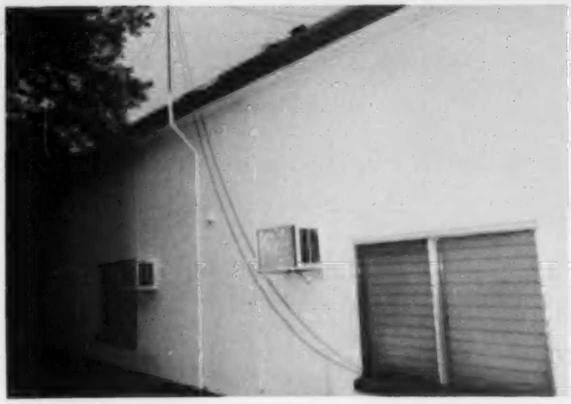
Need we say more?

$29.95

COM-SPEC
SEND
BATTERY
VOL
SQL
MHz
10kHz
ON
OFF
PWR

COMMUNICATIONS SPECIALISTS

426 West Taft Avenue, Orange, CA 92667
800/854-0547 California: 714/998-3021



Winter Park Sinkhole

ter. One almost expected some primordial beast to rear its head from the depths. The pit was 400 feet across, over 150 feet deep, and contained a dry cleaning plant, a TV store, a print shop, six Porsches, and the back end of an auto repair shop. For dessert, it had eaten a three-bedroom house, parts of two streets, and an Olympic-size city swimming pool.

I stood in the front door of my shop—just 125 feet from the rim—in total disbelief. I had been a resident of central Florida for awhile and knew that although sinkholes were not too uncommon, this gigantic one was very unusual. A passing police officer said that three other smaller sinkholes had opened up elsewhere in the county.

As the crater began to assume a round rim, however, I felt that perhaps my property would be saved. And when a telephone utility worker came by and muttered that if a nearby main trunk line went, south Florida would be sending letters for a while, I got an idea.

Here was the prospect of a communication emergency and mounting national and international interest. I should set up a portable amateur station on my property near the hole! I also had easy access to the local geologist's temporary field headquarters, where complete factual information would be available on this and other sinkholes.

I made the ten-minute trip home and rushed into the shack. I wondered—what kind of antenna? What rig? What about power? I would have to homebrew an antenna. I grabbed some RG-58/U from a pile of Hamfest Fallout. I also found some 450-Ohm ladder line. In the utility room, I had a coil of Romex house wiring, scraps of stranded copper wire, and an old extension cord. I borrowed a marine battery from a neighbor. I was certain that I could do something with all this wire, but to be sure, I took the matchbox tuner. I also chose my tube-type rig (Drake R4B and T4XB) rather than my new solid-state rig because of the reputation of tubes in the finals during high swr conditions.

Finally, I took along my dummy load, a ham's most important device. I knew I could tune the rig with the known 50-Ohm value of the dummy load.

My station wagon looked as though I had just come from a binge at a hamfest. My XYL came running down the driveway with a D-104 mike and a CW key. She advised, "Be careful, Honey, and you need these, don't you?" I could see bits of tears in her eyes, and, had I waited, I think she would have renewed her pledge to get her ham ticket.

As I drove back to the shop, I heard national network news on a local station exclaim, "And in Winter Park, Florida, a massive sinkhole continues to swallow the business district. . ."

I screeched to a halt in my parking lot and assembled the gear in the front room of the shop. In the office, I had a fresh copy of the May issue of *73*, and there in the pages was an article on coaxial dipoles! I fished out the RG-58/U and home-brewed a 20-meter coax antenna. My emergency mast was a piece of 1 × 2 wood stuck down in the toilet vent pipe on the roof. I taped the center of the dipole to the mast using duct tape and used twine to support the ends, one strung from a tree limb and the other from my business sign. The feedline came in through a window.

A quick hookup to the power supply, and the tubes began to glow. The antenna worked! I heard the reassuring crackle of CW, then a fast load-up, and I was on the air. The band was down at the time, but I was reaching New York and the midwest with 599 signals. My Advanced class ticket was barely a month old, so I went up to the phone bands.

During the next several hours, the amateurs I contacted by CW and phone were very interested in the facts about the sinkhole and surprised that there was an amateur station so close to the event. They asked about relatives in the central Florida area, and we would tell them what we knew about the other sinkholes as well as ours. Several amateurs were concerned about their properties in Florida, and we provided information regarding water rationing in southern Florida as well as on sinkhole damages in the central areas.

Two days later, the geologists and city officials felt that the massive hole was stabilized and only minor expansion would continue. They decided to open Fairbanks Avenue, but for pedestrian traffic only. The crowds were huge. The Great Winter Park Sinkhole became the number one attraction in central Florida. We estimated that over 35,000 people flocked to the area to see the awesome sight. I made some quick arrangements with a T-shirt firm and reopened my business to cater to the crowds. On the front counter remained my portable rig, and we continued to operate, to the delight of the crowds.

I was forced to remain in my building for long hours during the initial collapse phase so that I could respond to the city engineers and be informed of the status of my property. After

Reader Service for facing page ✓331→

AZDEN PCS-300
6.820
M.ADRS 12345678
Shown Actual Size

The Standard for Comparison

New AZDEN® PCS-300
2-M Handheld FM Transceiver

8 MHZ COVERAGE • 142 to 149.995 MHz in 5 kHz steps, including CAP and MARS.

IDEAL SIZE & WEIGHT DISTRIBUTION • 7.3" high by 2.5" wide by 1.8" deep; 1.4 lbs.

MICROCOMPUTER CONTROL • All frequency operations are done by means of a microcomputer keyboard with acquisition tone.

LCD DISPLAY WITH TIMED LAMP • Draws almost no current. Lamp times out automatically after 20 seconds.

16 KEY AUTOPATCH • Keyboard works as a Touchtone® pad while transmitting.

PL TONE SWITCH • Actuates optional subaudible tone module.

PROGRAMMABLE "ODD SPLITS" • Transmit and receive on any possible frequency combination. Reset in seconds.

9 CHANNEL MEMORY WITH SCAN • Eight addressable channels and one externally accessible up/down channel retain frequency and standard offset. Backup drain is a scant 10 microamps!

AUTOMATIC INCLUSIVE OR EXCLUSIVE PROGRAMMABLE BAND SCAN • Limits may be reset in seconds. Scans either inside or outside the limits.

BUSY AND VACANT SCAN MODES • Scan for either an occupied or empty frequency.

KEYBOARD LOCK • Prevents accidental change of frequency or scan status.

TRANSMIT LOCK • Avoids unintentional transmission.

DIGITAL S/RF AND MEMORY ADDRESS METER • Shows relative signal strength on receive, relative power on transmit. Also shows memory address.

HIGH OR LOW POWER • 3 watts high, 1 watt low. Low power is continuously adjustable from 0.5 to 3 watts.

TRUE FM • Not phase modulation – Unparalleled audio quality.

AUTOMATIC FRONT END TUNING • RF stage is varactor tuned for superior sensitivity and selectivity.

RUGGED COMMERCIAL-GRADE MODULAR CONSTRUCTION The PCS-300 is built to take years of the toughest operating conditions.

SUPERIOR RECEIVER • Sensitivity is 0.25 uV for 20 dB quieting, 0.2 uV for 12 dB SINAD.

BNC ANTENNA CONNECTOR •

STANDARD ACCESSORIES • Heavy duty NICAD battery pack (500 mAh), belt clip, hand strap connector, flexible rubber antenna, earphone, ac charging unit, and special stand for table-top operation.

OPTIONAL ACCESSORIES • Deluxe leather case, mobile dc charging cord, external speaker/microphone, and PL tone module.

MANUFACTURER: **AZDEN** JAPAN PIEZO CO., LTD.
No. 12-17, 1-chome, Kami-Renjaku, Mitaka, Tokyo, Japan, Telex: 781-2822452

EXCLUSIVE DISTRIBUTOR: AMATEUR-WHOLESALE ELECTRONICS, INC.
8817 S.W. 129 Terrace, Miami, Florida 33176 Telephone (305) 233-3631 Telex: 80-3356 Toll-free (800) 327-3102

the worst was over, I decided to experiment with the variety of materials I had and see just exactly what I could accomplish in antenna design with the barest of essentials.

I was pleasantly surprised to find that almost anything can be made to radiate. The antenna tuner was worth its weight in gold. Using coax feedline and standard dipole lengths, I constructed radiators from stripped Romex house wiring, lamp cord, and even a piece of transformer winding. The most novel was a length of kite-string doused with salty water! We assembled it on the roof and sponged on the brine. It loaded up fine, but then the swr meter went crazy. The observer on the roof yelled down, "Hey, the water is drying up!" Either the hot sun or the rf was evaporating the salty solution. We tried loading the string again at night, but evaporation was still rapid, so we never did conclude what the real culprit was. Perhaps it was a combination.

One fascinating observation was made with an end-fed zepp. The capacitance of the antenna and tuning values seemed to follow a slow shift while operating during the day and evening. I was baffled. The 40-meter antenna hadn't moved, we hadn't readjusted the rig, and nothing seemed to have changed. Late in the evening, however, a geologist was updating me on the hole and mentioned that the water was slowly rising in the bottom of the sinkhole. Could it be that the capacitance to ground had been changing and it was detected by the tuning values of the antenna? Since the level of water in the hole was the basic level under the building and antenna also, perhaps we had discovered a way of measuring the water table using antenna values!

There did seem to be a correlation, and the head geologist was excited about the prospects. This was real ham radio—experimenting, learning, and discovering!

On the operational side, I learned a lot of things since most of the time I was in the middle of a pileup. I found it difficult to write down the calls and reports and work the PTT button or the key. I soon developed the skill of writing with the right hand and working the PTT with the left. A footswitch would have been nice!

I gave up on VOX action due to the local noise level. On phone, rather than working one station at a time and then calling QRZ, I copied down all the calls I could hear within about 10 seconds and, as the action died down, repeated their calls. As soon as I had a list of a dozen or so, I worked each of the calls on the list. I found this system to be much more efficient than creating a shouting match after each call. On CW, I found the operators to be a little easier to work. I also discovered that the pileups occurred on CW down around 14.025 to 14.030, the secret hideout of the fluent CW ham.

To encourage participation with us, we developed a certificate, the W.A.S., or "Worked All Sinkholes." This bit of wallpaper served as a QSL and as an item to create interest.

Armed with a hemisphere map, I began to plot areas where our signal was reaching at various times of the operation. Sure enough, you could see the zones as the reports came back to us. I reconfirmed that by raising the antenna one lowers the angle of the radiation and thereby changes the area of coverage.

I continued to learn things back in the shack. I began to make lists of the things to remember during portable operation: Remember a box of spare fuses! Don't smoke around a battery; the bubbles are hydrogen! When you do run an ac power line, tape it down so that you don't trip over it. Little pieces of colored tape help to code things such as ground wires, coaxes, and connecting cords. Be sure to log all third-party traffic. Be as neat as possible on your main log or you find yourself wondering whether it was a U or a V, and what was that other letter?

I was amazed at the reaction of the general public to the operating amateur station. They seemed interested in the phone operation and somewhat confused by the CW. Using very unscientific sampling methods, the "sinkhole poll" showed that fewer than one in ten realized we were operating an amateur station. Only those who had a relative or friend in amateur radio understood the capabilities of amateur communications.

We did find spectators who were fascinated and very interested, however—maybe two out of ten people. Many were youngsters and teenagers. We furnished the names of several local amateur clubs, a local supply company, and magazine addresses. We wished we could have offered them more information. It is our opinion that amateur radio needs to do much more self-promotion and training of interested newcomers. The type of high-visibility operation that we carried out is a useful technique for raising the level of awareness of amateur communications in the general public.

As a final note, I must say that the sinkhole experience has been one of the most rewarding events of my life, and I am happy that amateur radio was a big part of it. I used to dream about the thrills of a far-off DXpedition and some remote island with waves crashing against a rocky beach.

There I was, in a tent, with the rigs fired up. As I sipped on coconut juice and stared at the big beams on temporary masts, I could hear half the amateur radio world calling me, amidst the cries of the seagulls! Ah, what a life!

Well, now I agree with Dorothy when she told the Wizard of Oz that she had learned her lesson. If I ever go searching for someplace special, I need only look in my own backyard! Sooner or later we will all get a chance to be in the middle of action, and we need to be prepared. Your chance may be next! ■

The Special Sinkhole Crew Advisers and Helpers

Joe Lewis WB4WPP
Gilbert Potyandy K4ISK
Dan Martin KC4GO
Ed Cox W0RAO/4
Jack Leavitt KA4ATV
Fred Hopkins N4EDM

Joe Lewis demonstrated his skills at a pileup that he learned while in Saudi Arabia as a field technician. Gilbert kept the rigs in repair and offered his technical skills. Danny Martin claims he is going to patent his special Toilet Vent Mast! Ed Cox first spotted the hole, and maintains the 2-meter link. Jack Leavitt and Fred Hopkins kept up the local interest and worked on the certificate.

The schedule now is sporadic, but normally is around the lower end of 20-meter CW (General portion) and 20-meter phone. To offer Novices and Technicians a chance, we work the lower end of 40 meters and 15-meter Novice CW. An SASE will get you the regular schedule by the month.

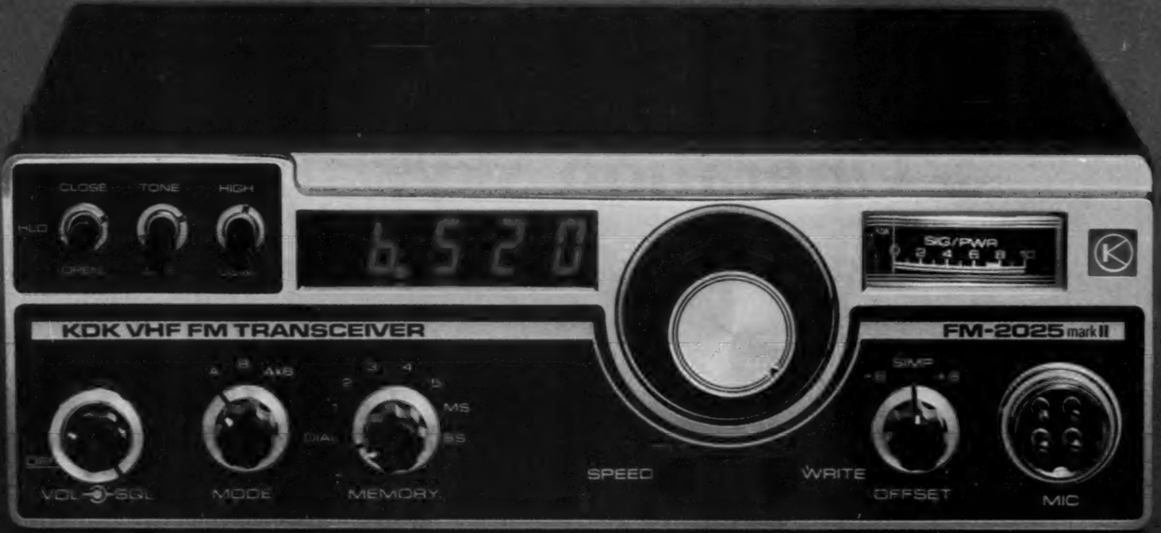
←Reader Service for facing page ✓81→

KDK MAKES 2 METER FM
SIMPLE AND EASY!

KDK

KDK INTRODUCES A NEW GENERATION OF 2 METER FM RADIOS.

The sparkling 2025A MKII is loaded with new features! East of operation is the design concept at KDK.



SPECIAL! WINTER SALE! $299

Includes:
Touch Tone® Mike (Ready to Use)
ORDER NOW DIRECT

- Features such as ten channel memory in two banks of five each, a solid 25 watts of power, full MARS and CAP coverage from 143,000 Mhz to 148.995 Mhz, plus built in memory retention for up to one year . . . and much, much more makes this the radio of the year. If you have been waiting to move up to a new model, or have wished for a radio with "everything" . . . KDK has it!
- The ten channel memory is easily addressable and you have two banks of five channels each. You can even use both banks at once for odd splits.
- Standard 600 hz shift up or down. Band scan or memory scan. Memory scan is easy. There is also band scan with upper and lower limits you can choose yourself!
- Built in nicads for the memory retention which has drain in nano-amps, not milli-amps. The internal battery will hold the memory for up to one year! No other radio offers you this feature.
- Fast and easy dialing. Full solid state dialing and you can choose from the front panel either a fast or slow dial rate.
- No relays are used, only solid state switching. This eliminates a trouble spot many radios encounter.
- KDK has also eliminated another trouble spot by completely hand wiring each radio. No internal plugs to become intermittant and no wire wraps either, just good solid wiring.
- KDK gives you one of the hottest receivers you can find. By using UHF (not VHF) dual gate MOS-FETs with electronic auto tuning for the RF amplifier and the first mixer, you have a combination of ultra sensitivity and maximum quietness.
- The audio output stage in the 2025A Mk II uses an integrated circuit which has internal protection against over-voltage and shorted output conditions. Plus it is a high audio output chip – just what you need in a noisy mobile situation.
- The transmitter uses direct VCO varicap modulation for true FM. Your transmitted audio sounds as it should; crisp, clear and natural.
- The power output stage of the 2025A Mk II will not break down even with an infinite VSWR load, and uses heavy duty solid state antenna switching with a four stage low pass filter. All this gives you an exceptionally clean, spur free output.
- KDK has included an adjustable sub audible tone circuit which can also be used for CTCSS or tone burst on transmit. Again, more features!
- Size is 2 7/10" high – 7 1/8" wide – 9 1/2" deep.
- You can switch from 25 watts to 3 watts low power.
- And, of course, the DC cable is included along with the microphone and mobile mounting bracket.

ORDER NOW DIRECT
CALL TOLL FREE
800-251-4141

This number for **ORDERS ONLY!**

Mail Order – COD – Bank Cards VISA Master Charge

HOURS – 9:00 - 5:00 CST Monday - Saturday
Phone (615) 865-7949
Telex 80-8327

Write for brochure – Dealer inquiries invited!
Warranty information available at your dealer
Company reserves the right to change specifications without notice.
Exclusive US Distributor – Dealers Welcome!

ORDER DIRECT
OR AT YOUR DEALER!

KDK

Distributed by:

KDK DISTRIBUTING CO., INC.
617 SOUTH GALLATIN ROAD – MADISON, TN 37115
Phone (615) 865-7949

Operation Skywarn

—tracking tornadoes with two meters

Bill Richards WB5ZAM
1925 Juanita St.
San Angelo TX 76901

The following is a true and factual account, to the best of my recollection.

Time: 1900 hours local, on a partly cloudy day in late May.

Location: San Angelo, Tom Green County, Texas.

Frequency: 146.34/.94-MHz repeater.

"Well, guys, I'm tired and both my batteries and the ones in my talkie need a good night's recharge, so I'm going to pull out. If that cloud to the west looks like it's going to do anything, holler. I'll have the radio on but just monitoring. KA5BNJ and the group, this is W5FZY clear, adios."

"OK, Elmer, we'll see you. W5FZY clearing, this is KA5BNJ. Pick it up Noel. WD5BHX, this is KA5BNJ."

"Break! Break!"

"Go ahead break-break, this is KA5BNJ."

"Sorry to interrupt, John, but the Weather Service just issued a tornado warning for the western part of this county and Irion County [directly to the west of Tom Green County]. At 6:45, DPS [Department of Public Safety] reported a tornado on the ground 10 miles north of Mertzon [25 miles southwest of San Angelo] with an apparent northeasterly path. If you don't mind and there are no other volunteers, I'll go ahead and assume net control and activate the Skywarn Net."

There were no volunteers.

"This is WB5ZAM assuming net control for the Concho Valley Severe Weather Net. Do we have anyone on who has information for the

Is this a tornado? Members of the Concho Valley Severe Weather Net were not sure, but they kept a close eye on the ominous clouds.

net regarding the severe weather in the Mertzon area? If so, please call net control, WB5ZAM."

"This is K5JEZ Mertzon. Bill, we've got winds at 30 to 35 miles per hour from the west and northwest, with light rain. We aren't able to see very far to the north, but there are two large thunderheads to the west and northwest of me."

"This is W5RSV mobile, and I'm about 10 miles northeast of Charlie, and those clouds he's talking about are really building fast. It hasn't started to rain or blow here yet but those clouds are very dark and it does appear to be raining over towards Mertzon."

"Thanks, Charlie and Marion. This is WB5ZAM, net control for the Concho Valley two-meter Severe Weather Net, do we have any other reports of severe weather or anyone who can go to the Weather Service and man the station there? If so call WB5ZAM, net control."

"This is WD5BHX. Bill, if no one else can go, I'll be free here in a little bit and will go out, but I'm handie-talkie portable in the mall now. WB5ZAM, this is WD5BHX."

"Thanks, Noel. Is there anyone able to man the station at the Weather Service, please call now. If there are any other reports of severe weather, please call now. This is WB5ZAM, net control for the Concho Valley Severe Weather Net."

No volunteers spoke up.

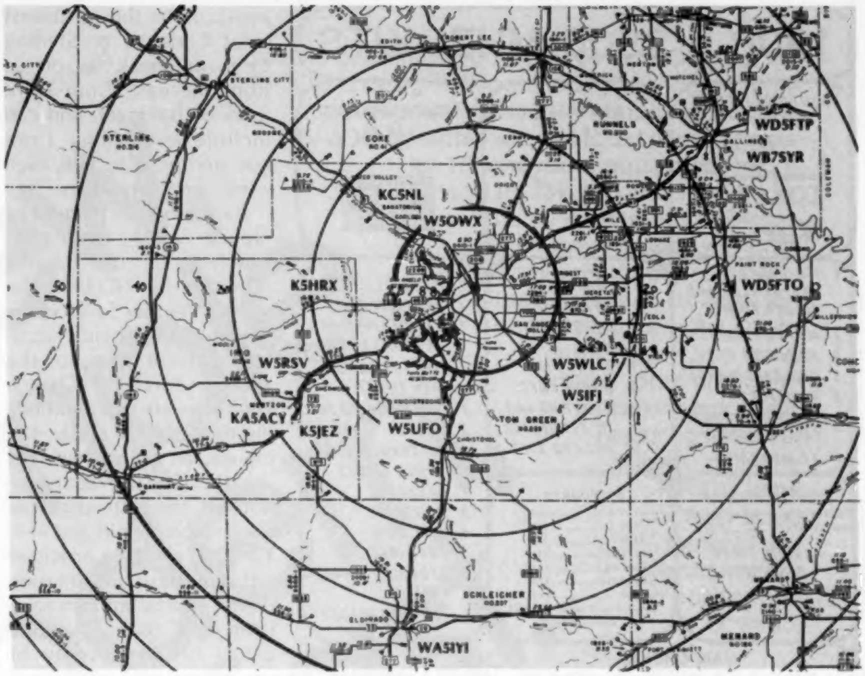
"No takers. Would you mind, Noel? I know Art could use someone experienced with the rig and the net."

"We'll be en route very shortly. WB5ZAM, this is WD5BHX."

"Thanks, Noel. Do we have any other net members with reports of severe weather only? Please call net control, WB5ZAM."

"KA5BNJ."

"W5OWX."



San Angelo, Texas (Tom Green County) and surrounding counties, with the locations of local hams. The rings mark ten-mile intervals from San Angelo.

"Break. This is Art at the Weather Service, W5QX."

"Go ahead, Art."

"Gentlemen, we have a tornado sighted by a DPS trooper, 10 miles north of Mertzon with an easterly path. We also have a line of thunderstorms of marked severity extending from 20 miles northwest of Mertzon to 20 miles west of Ozona, with a path of movement to the east and northeast at 20 miles per hour. These contain heavy rain and hail and do indicate tornadic-type winds aloft. This is W5QX."

"Thanks, Art. We have activated the net and Charlie reports 30- to 35-mph winds with light rain at Mertzon, and Marion reports light winds without rain 10 miles northeast of him. He does report heavy thunderstorms to the west. Thanks for your information and we do have someone on the way to man the radio for you. W5QX this is WB5ZAM, net control for the Concho Valley Severe Weather Net. Do we have —sorry, John, KA5BNJ."

"Bill, we have light rain and a westerly wind at 10 to 15 miles an hour here at Carlsbad [20 miles NW of San Angelo]. WB5ZAM, this is KA5BNJ."

"Thanks, John. W5OWX, WB5ZAM."

"Bill, the weather is about the same here, but I can hear thunder to the west and northwest of me, here in Grape Creek [12 miles NW]. WB5ZAM, this is W5OWX."

"OK, Al. This is WB5ZAM, net control. Do we have other check-ins with severe weather reports only? Please call WB5ZAM, net control."

"This is K5JEZ."

"Go ahead, Charlie."

"Bill, the wind has changed to the west and northwest, at 38 to 40 miles an hour—no, there's a gust to 50 miles an hour, and we have heavy rain now. If I lose power, I'll go to the mobile and be right back. WB5ZAM, this is K5JEZ Mertzon."

"OK, Charlie. Art, did you copy? W5QX, WB5ZAM?"

No response.

"WD5BHX?"

"Yes, Noel?"

"Bill, I'm en route to the Weather Service now. Art probably heard that report but was unable to reply as he went back to the radar. I'll have the radio manned very shortly. WB5ZAM, WD5BHX."

"OK, Noel. This is WB5ZAM, net control for the Concho Valley Emergency and Severe Weather Net. Do we have other reports of severe weather?—and if not, we'll begin taking check-ins from portables and mobiles, then we'll come back to the fixed stations. This is WB5ZAM."

"W5RSV."

"K5JEZ."

"Yes, Marion?"

"Bill, the winds are buffeting the pickup pretty good now and we have a very heavy downpour here. Over."

"OK, I'll note that to Art. Go ahead, Charlie."

1900 – 2500 MHZ KITS

DOWN CONVERTER KIT
$19.95

ANTENNA KIT
$19.95

POWER SUPPLY KIT
$19.95

1 P.C. BOARD PRE-DRILLED AND SOLDER FLOWED
3 MRF901 TRANS.
2 HP DIODES
6 CHIP CAPS "LARGE"
8 RESISTORS
4 PREPAIRED COILS, FACTORY WOUND
1 10 MFD CAP.

33 WASHERS
32 SPACERS
1 3 FOOT ROD
2 NUTS
1 8" PVC PIPE
2 4" END CAPS
1 MOUNTING BAR
1 "F" CONNECTOR
1 NUT AND BOLT

1 P.C. BOARD
1 POWER TRANSF.
1 317L ADJUSTABLE REGULATOR
1 FINE TUNING POT. WITH SWITCH
1 COARSE TUNING POT.
2 KNOBS
3 "F" CONNECTORS
4 POWER DIODES
1 RF CHOKE
3 RESISTORS
3 DISK CAPS.
1 1000 MFD CAP.
1 DPDT MINI TOGGLE SWITCH
1 LED WITH HOLDER

SUPPLY CABINETS
ALUMINUM CABINETS PREPUNCHED TO FIT
POWER SUPPLY KIT........$9.95

MANUFACTURED CABLE SETS
100FT. PLUS 3FT........$19.95
75FT. PLUS 3FT........$15.95
50FT. PLUS 3FT........$12.95

DISCOUNTS
2 TO 4........10%
5 TO 9........15%
10 TO 24........20%
25 TO 49........25%
50 TO 99........30%
100 TO 999........35%
1000 UP........40%
DIFFERENT KITS CAN NOT BE ADDED FOR QUANITY DISCOUNTS.

MAIL ORDERS
ADD $5.00 FOR SHIPPING AND HAN-DLING.
INDIANA RESIDENTS ADD 4% SALES TAX.

MasterCard
American Express Cards Welcome
VISA

TRIONYX IND. INC.
6219 COFFMAN RD.
INDIANAPOLIS, IND.
46268 ✓104
(317) 291-7280
(317) 291-2995

"Yeah, this is K5JEZ. The rain has let up some, but it's still pouring and the winds have settled down to 25 to 30 miles an hour, out of the west."

"Thanks, Charlie. K5JEZ and W5RSV, this is WB5ZAM, net control . . ."

And so it went, with thunderheads building to the west and southwest and moving in our direction. We had 46 check-ins: 18 portables, 12 mobiles, 14 fixed, and 2 via telephone, and we watched clouds for just over three hours as they built up and then dissipated.

This quick response on the part of local amateurs was not due to our working as communicators, but due to the weekly practice sessions, where everyone gets a chance to check in, test antennas, and even call the net, to get the hang of calling up the group and maintaining the net. From mid-April through mid-June, we get the real thing with frequent storm development and the possibility of severe weather developing. We watch not only for the Weather Service-NOAA, but for ourselves, the local media, and (you would be surprised who listens to the repeater frequencies during severe weather!) the numerous shortwave listeners.

Due to the size of the area we need to watch for threatening storms, we in the Concho Valley have tried to get the best repeater coverage possible and to keep all amateurs informed of the frequencies and nets. Our net members include lawyers, nurses, ranchers, retirees, salesmen, housewives, Armed Services personnel, executives, and college students. We will have check-ins from as many as 70 air miles away and as close to the repeater as two blocks. The storms that affect us can build near Ozona (70 air miles southwest), or to the northwest (near Carlsbad or Sterling City), or sneak up on us from the east, from Paint Rock or Ballinger, and can include everything from rain and wind to hail, high winds, and tornadoes.

Basing our techniques of cloud-, wind-, and rain-watching on the training provided by NOAA's National Weather Service, we are able to provide accurate information to the Weather Service and hence keep it aware of conditions on the ground under the clouds, an area where the Weather Service radar cannot tell the difference between blowing dirt and hail. To date, we have provided not only basic information on the storms but also have been able to act as indicators of the severity of storms, including the severity of the winds and actual amounts of rainfall. We also have been able to give aid when the radar at the Weather Service was inoperable, giving warnings of high winds and hail as a cell moved into the area.

We found that the best way to keep everyone current (as to who lived where in our area) was to publish a directory of local hams and take a highway department map and overlay it with concentric rings, approximating by tens the aeronautical miles from San Angelo. The map also has the sites of the three 2-meter repeaters and the site of the 450-MHz repeater. We then took the maps and used them to coordinate tests on the emergency-powered repeaters so as to test where we could reach the repeaters with what level of equipment (i.e., with a one-Watt handie-talkie, or 10 or 25 Watts, or if a directed array was necessary). All net and club members then were given maps, a list of current net check-ins, and the opportunity to call up the net in the weekly practice sessions.

Since the storms take fairly consistent paths, we found that a map showing the area southwest and west would serve better than a true circle around San Angelo. The map gives the net control an idea of who lives where in relation to a storm cell, and net control thus is able to ask these specific individuals for information on the cell, whether it is moving toward them, away from them, or around them. Then the net can ask for mobile stations to move to points paralleling the projected path of the storm. Since we have only about 60 amateurs active on 2 meters, this map gives the net control an idea of where each member is—especially those in the outlying towns.

The continuing improvement in the educational services from NOAA has helped to train more and more amateurs in the Skywarn system and has increased the number and accuracy of reports during the severe weather months. We also installed equipment at the Weather Service, giving them ready access to the net frequency, and have worked with them to get amateurs into the Weather Service during inclement weather to give them a trained communicator to exchange information between them and the spotters of Operation Skywarn.

So, the next time you hear a net call-up on 2 meters (or if you haven't tried 2 meters), go set your FM public service receiver or scanner to the net frequency; when the next severe weather system blows in, you can watch the storm through the eyes of others and know whether you are going to get a springtime shower or a frog-strangler. You, too, may want to join the "professional" amateurs on the Severe Weather/Operation Skywarn nets and help keep an eye on the storms. ■

To be introduced at Dayton Hamfest

New, Simple, Modern, Fast.

Capable of communication rates to 300 baud, the TU-300 is designed specifically for modern high-speed and standard RTTY applications. The TU-300 operates with standard microcomputer, TTY and radio equipment and is TTL and RS 232-C compatible. Controllable by remote, this next generation terminal unit with innovative modular design provides more than six times the conventional amateur data transmission rate using present radio and computer equipment. Featuring three frequency shifts, the TU-300 is the only 300 baud terminal unit offered in easy to construct kit or wired.

TU-300

Flesher Corporation
TU-300
POWER
SEND
RDA
MARK
SPACE
TUNE
POWER
REVERSE SHIFT
AUDIO FREQUENCY SHIFT

DEALERS! Flesher Corporation is seeking qualified dealers for the US and international markets. For complete dealer information, call or write TODAY!

- 300 baud communications rate
- crystal controlled AFSK with downshift CW ID
- autostart motor control with AC outlet
- remote operation

- high quality commercial construction
- modular design with steel case for RF shielding
- indicator type push-button switches
- separate send and receive "reverse shift" controls

- bar graph tuning and LED function indicators
- mark-hold and selective fading compensation
- 3 shifts (170Hz standard - other shifts extra)
- oscilloscope tuning outputs

- easy to tune multipole active filters
- TTL and RS 232-C compatible I/0's
- optional 20 and 60ma optically isolated loop supply
- simple kit construction - no instruments needed for alignment with AFSK installed

For more information about the TU-300, contact:

Flesher Corporation
507 Jackson • P.O. Box 976 • Topeka, Kansas 66601
913-234-0198 • Telex 437125

✓23

Ben Johnson
77 Ridgeway Avenue
Rochester NY 14615

Measure Ohms with Your Calculator?

—yes, and accurately, too!

Undoubtedly the dumbest electrical measurement made on a multimeter is the one on the high end of the Ohms scale, where the figures are so crowded together that what you read is more a matter of faith than reality. And then there's the zeroing problem—was the meter zeroed when you started?

Now, at last; there's a better way that doesn't crowd readings or require rezeroing . . . a linear, digital ohmmeter with great high-resistance sensitivity that exceeds the 20-megohm limit of many commercial digital multimeters!

But the best news is that you can put it together yourself in a cheap pocket calculator! Nowadays these little four-bangers are frequently on sale for less than the cost of their individual parts. This amounts to the manufacturer doing most of your assembly work and providing a professional-looking, compact case as well. Try agonizing through the alternatives and you'll quickly see what I mean in terms of the cost/benefits ratio. All this

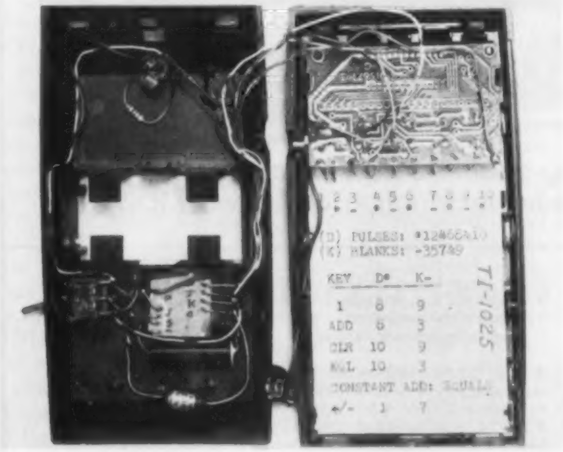


Photo A. Clamshell view of the completed calculator transformation. The final range capacitor is a 1-microfarad tantalum between switch and module. Just four wires connect to the calculator circuit proper; they were left long for strain relief. The assembly is ready to be closed up and used.

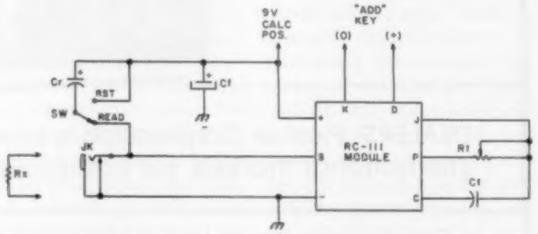


Fig. 1. Circuit for converting calculator to measure resistance.

Parts List for Fig. 1

Cf—Filter capacitor, 10-100 uF, electrolytic
Cr—Range capacitor, polyester, 1-2 uF (see text)
Ct—Timing capacitor, polyester, .05 uF
Rt—Timing resistor, minipot, 1 megohm
Rx—"Unknown" or calibrating resistor, 1 megohm, 1%
JK—Phone (test) jack, miniature, w/plug and test leads
SW—Switch, SPDT, miniature, bat-handle toggle

Above parts are readily available from normal sources.

RC-111 Module—Available from Kaltek, Box 7462, Rochester NY 14615 ($14.62 ppd., plus NY state sales tax if applicable).

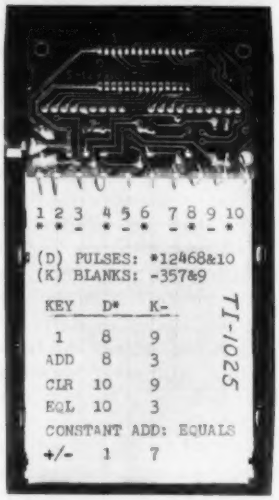


Photo B. Ten wires connect the keyboard to the calculator chip/display board. An oscilloscope from ground to each wire in turn identified the wires carrying digits pulses. The scope between each of these wires and each of the other "keys" wires showed which key joined each pair. The table shown cracks the code for the keys of interest. The module connects to the constant-add pair, numbers 10 and 3.

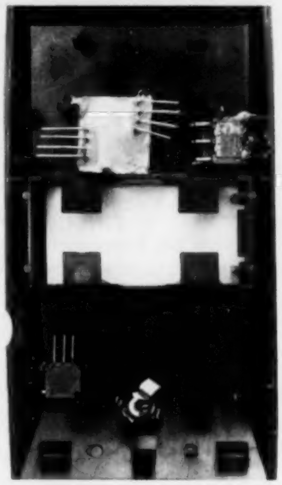


Photo C. The main fixtures—module, actuating switch, test jack, and count-rate pot—are stuck in the bottom of the TI-1025 case with hot-melt glue. This stuff is handy and can be cut off the stick and melted in place with your soldering iron. You don't need to buy the glue gun for the job.

is now made possible by a newly-available module that begins where the calculator manufacturer left off . . . and does lots more.

Fig. 1 shows the simple circuitry needed to transform your four-function, constant-add calculator into a *pièce de résistance*. So few parts are required that the whole addition almost invariably will fit completely inside the original case with room to spare. With simplicity like this, even the nicety of a printed circuit board is not worth the extra time and effort. The only external bits of evidence that your new instrument does more than calculate are the actuating switch, the test jack . . . and the smug look on your face when your friends see it do its stuff. You may, of course, want to exceed the bounds of the original case, but later.

How It Works

The brain of this little circuit is Kaltek's RC-111 hybrid CMOS module with eight leads emerging from its 2 × 2 × 1 centimeter package. It utilizes the familiar time-constant principle to determine the value of the resistor under test. The calculator is caused to count and thus act as a timer to measure the time it takes for range capacitor Cr to charge through the unknown resistor, Rx. The counting function stops at a certain charge level on Cr as sensed by the high-impedance input (S) of the module.

The counting rate is adjusted by the combination of Rt and Ct, so what shows up when the display stops counting is a number equal to the value of Rx, with various numbers of decimal places determined by the size of Cr. Your personal intervention merely involves clearing the display and entering an initial "1" to count from, then flipping the actuating switch. Your calculator retains, unimpaired, all of the original functions it had, when the display is not running or when the test leads are removed to short the jack. If you have any parallel- or series-resistance calculations to make after the display shows the value of your unknown, you are immediately ready to make them on the keyboard.

Construction

There's really so little to do that the circuit diagram tells it better than words. About the only precaution is on behalf of the CMOS-based RC-111 module, which, although protected as well as functional requirements allow, should be handled so as to avoid any exposure to static electricity. That is, ground yourself and your (non-transformer) soldering iron before touching the module leads. Once it's in the circuit, it's rather safe (if wired as shown, of course).

For openers, wire the module separately as shown, with the leads uncut. Their functions are identified on the case. You need to start from some convenient known condition. For calibration accuracy, a 1% resistor should be chosen, somewhere around one megohm. For ease of handling the corrective arithmetic, use a 1-microfarad capacitor for Cr, of any tolerance. Chances are that you'll have to change or pad it later, any-

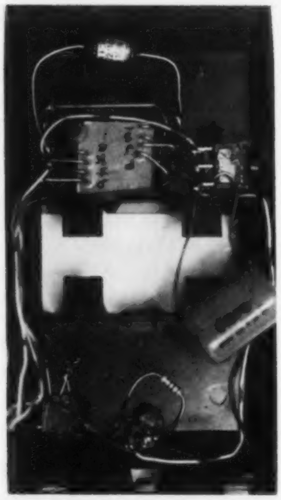


Photo D. A 10-megohm resistor was soldered across the jack as an internal reference, and a 2-uF range capacitor (blurred) was temporarily enlisted to give a 20-second time constant for setting the counting speed. At top speed, the count was about 220 for the ten-megohm resistor, indicating that the range capacitor should be 1 microfarad and the timing pot slowed down for a count rate of 100,000-Ohms-per-count. The module lead identity is cast in the sides of the package; they were transcribed on the facing surface for clarity.

Photo E. The only things showing externally are the jack and switch . . . and your own look of satisfaction! The author plugged a photocell in the jack and used the freshly-built instrument as an enlarging exposure meter to make these prints. Only an initial test print was required to get the range.

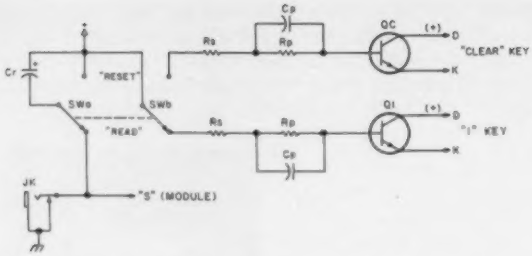


Fig. 2. Optional circuit to actuate CLEAR function, enter 1, and perform the READ function all from a DPDT switch.

Parts List for Fig. 2 (see text)
Rs—.5 to 1.5 megohm, ¼ W
Rp—10 to 22 megohm, ¼ W
Cp—.01 uF, ceramic, 10 V
QC,1—NPN silicon transistors, general purpose
SWa,b—DPDT toggle switch (replaces SPDT of Fig. 1)

how. The pot (Rt) should be at the high-resistance end of its span to begin with.

Now get intimate with your calculator. For the easiest trip, choose from the National Semiconductor Corporation's NOVUS 600 series or their private brand equivalents that now carpet the terrain like transistor radios ("Mathbox," for example). Some have fixed or switched-on decimal points. All have the necessary constant-add function, which means that if you enter a number and repeatedly punch the "ADD" key, the number will be added to itself in the display. Other brands with this function are also good contenders, but these are easy to find, cheap, and very cooperative. The earlier ones have an 18-DIP chip for the calculating, designated MM5736; later ones have the same characteristics, but the chip is buried under a plastic glob on the flip side of the display board.

Some have LED drivers, and some don't. That aspect doesn't matter. What does matter is how easily you can find and identify and polarize the leads from the CLEAR, 1, and ADD keys. The calculator can be a junk-box habitué, and many are by now for various reasons. If yours failed mechanically on the keyboard from bad key contacts, you still can use it for an ohmmeter and inject new life into the old box. For a DIP-cased MM5736 chip, the needed pin identifications are in Table 1.

The shared pin in Table 1 is coincidentally a result of the matrixing of the keyboard; all keys are shared, but you won't need the rest. Chances are if you are compelled to poke around looking for the needed ones, though, you'll find at least half the others first (in which case, if I didn't forewarn you, you might be non-plussed—minussed, even—to discover all these funny coincidences yourself).

If your machine isn't old enough to have pins, take a 10k-Ohm resistor and use it to jump the various keyboard leads you can spot, with a number entered in the display for you to watch the results on. Or, put your scope across the leads and poke the keyboard until the scope signal shorts. A standard ohmmeter used with calculator power off would do the same thing, but I hesitate to recommend putting its voltage, however low, on a dead section of the chip. The whole process only takes five or ten minutes with a resistor, and it's harmless. So try that method first, and as you identify the leads and determine their polarity from battery negative, mark everything down with a diagram to help you relocate the right ones later on.

Key	Pins	Called	Most-Positive	Remarks
ADD	1-3	D4-K3	1 (D4)	All "D" pins generate positive pulses to the K pins. ADD and CLEAR share pin 3 (K3).
1	4-17	K1-D2	17 (D2)	
CLEAR	2-3	D1-K3	2 (D1)	

Table 1. Pin identifications.

To recapitulate, at this stage you should have found your needed keyboard leads, identified their polarities, and have the module circuit wired and ready to connect to the calculator for temporary initial testing and calibration. With the power off, hook the module plus and minus leads to the calculator power points and set the module circuit switch to RESET, shorting the range capacitor. Now you're ready for the fun part, and you should make sure your battery is reasonably fresh, or else use an adapter. The MM5736 chip needs at least 6.5 volts to operate, but the module needs .5 volts more, so stay above 7.0 volts during testing.

Initial Testing and Calibration

Power up the calculator, clear the display, and enter a 1. Flip the module switch to READ and note that the display starts counting up from 1 and soon comes to a halt. You should then be able to enter more digits via the keyboard. Press CLEAR twice, enter 1 again, and flip the switch to RESET and then READ. Again the display should rack up about the same bunch of numbers.

So far, so good. Now you have proved that things are in working order and you can start shooting for the fastest counting rate your particular calculator chip can deliver. While alternately RESETing and READing the switch, twist your timing pot (Rt) towards minimum resistance to speed up the counting rate. You may get up to the magic limit of about 150 counts/second, but on average you'll hit around 60 before the display starts doing strange things like hesitating, stopping, showing EEEEEE, or otherwise not counting at a nice even clip. Back off on the pot setting and start over, babying up close to the forbidden point. Once you've found it, try timing the counts per second with a sweep second hand clock and record the results. You can do this most easily by leaving the switch at READ and putting a jumper across Cr, the range capacitor. That'll keep it running constantly.

So much for high speed; now you need to adjust your range capacitor so that the displayed number is a few counts higher than the value of the calibrating resistor . . . probably within a couple of decimal places. Say your Rx is one megohm and your count is 50 when it stopped running from a "1" start. That means you need to double your Cr value from its nominal one microfarad to extend the time to total 100 or more counts. Pick a combination of good capacitors for Cr that gets you there and a little beyond when paralleled with Cr. Run a few check counts, and then slow the count rate with the pot until it matches the calibrating resistor value. You should now have the best combination of high counting

WORLD TIME WATCH

the first microprocessor watch made especially for hams

24 hr. timer

microprocessor water resistant

solar assist

New Low Price —$59.95

The HAM-1 functions include local time, world time, (G.M.T. too) count-up and count down chronometer, day, month, date, alarm and hourly chime. It's ideal for log-keeping, DX time conversion and 10 minute I.D. timing. The HAM-1 features a high contrast Seiko display and solar cell battery assist. Battery life is better than 4 years. The HAM-1 is water resistant to 20 meters, the case is 100% solid stainless steel and the crystal is scratch resistant mineral glass. The HAM-1 is rugged and durable and has a 1 year warranty.

2 METER AMPLIFIER
$39.95

ACI AC-80 LINEAR AMPLIFIER

• 2 Watts In, 10 Watts Out • V.S.W.R. Protected • Can be Used for F.M. & S.S.B. • Led Status Indicators • Low Loss SO-239 Connectors • Current Drain Less Than 2.5A at 13.6 V.D.C. • Massive Heatsink • Built In T/R Switch

TEMPO S-1 UPGRADE KITS
$39.95

Upgrade your early Tempo S-1 to current Production Specifications, kits include: • 450 M.A.H. Battery Pack • New Case Assembly • All New Escutcheons • Spkr./Mic. Jack w/Dust Cap • New Earphone & Jack • P.C.B. and Parts for Easy Installation • Detailed Instruction Manual • For Radios With & Without T.T. Pad.

Other Accessories Available:

Spkr/Mic. Designed for S-1's. . .	$24.95
Heavy Duty Belt Clip.	7.50
Flex Antenna	6.00

To Order Call or Write to:

ADVANCED COMMUNICATIONS INTERNATIONAL ✓448
2411 Lincoln Avenue
Belmont, CA. 94002 U.S.A.
(415) 595-3949

Add $3.00 per order for shipping & handling. California residents add 6% sales tax. Visa, Master Charge accepted.

DAIWA Communications Essentials

Simultaneous SWR/Forward & Reflected Power Readings

SWR & POWER METERS

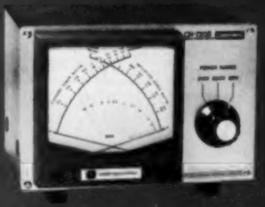
Tolerance: ± 10% full scale
Input/output Impedance: 50 Ohms
Connectors: SO-239

Model CN-620B (New 2 Kw Scale)

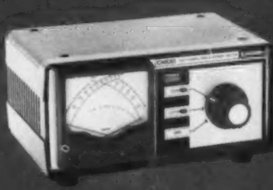
CN-620B
DAIWA
POWER RANGE

Frequency Range: 1.8—150 MHz
SWR Detection Sensitivity: 5 Watts min.
Power: 3 Ranges (Forward, 20/200/2000 Watts)
(Reflected, 4/40/400 Watts)
Dimensions: 165 x 75 x 97 mm;
6.5 x 3 x 4 in.

Model CN-720B (New 2 Kw Scale)



Frequency Range: 1.8—150 MHz
SWR Detection Sensitivity: 5 Watts min.
Power: 3 Ranges (Forward, 20/200/2000 Watts)
(Reflected, 4/40/400 Watts)
Dimensions: 180 x 120 x 130 mm;
7 x 4.75 x 5 in.



Model CN-630

Frequency Range: 140—450 MHz
SWR Detection Sensitivity: 5 Watts min.
Power: 2 Ranges (Forward, 20/200 Watts)
(Reflected, 4/40 Watts)
Dimensions: 180 x 85 x 120 mm;
7.12 x 3.37 x 4.75 in.

Automatic Antenna Tuner Model CNA-1001

Frequency Range: 3.5—30 MHz
(WARC & Amateur Bands Only)
Power Rating: 500 Watts PEP
Internal Dummy Load: 50 Watts/1 Minute
Impedance Matching: 15-250 Ohms to 50 Ohms Resistive
Input Power Required for Automatic Tuner: 1, 5 or 10 Watts (Set by rear panel switch)
Tune-up Time: 45 Seconds Max.
Power Requirement: 13.8 VDC/.2 Amp

Coaxial Switches

Power Rating: 2.5 kW PEP, 1kW CW
Impedance: 50 Ohms
Insertion Loss: Less than .2 dB
VSWR: 1:1.2
Maximum Frequency: 500 MHz

Isolation: Better than 50 dB at 300 MHz; better than 45 dB at 450 MHz; adjacent terminal
Unused terminals grounded
Connectors: SO-239

4 Position/ Model CS-401

2 Position/ Model CS-201

Exclusive USA agent for these units; inquiries invited.

Write for literature.

J. W. Miller Division
BELL INDUSTRIES ✓308
19070 REYES AVE. ■ P.O. BOX 5825
COMPTON, CALIFORNIA 90224
Phone (213) 537-5200

speed and as much resolution as your chip can deliver.

For practical purposes, you are now ready to make a neat mess and pack it into the calculator-cum-ohmmeter. You may, however, want to consolidate your pile of add-on capacitors into the fewest number that will do the job. Try to stick with polystyrene or polyester caps to minimize dielectric absorption, which tends to throw off your first reading. Or else learn to accept the first reading and ignore any changes in a rapid retest of the same resistor. In any case, recheck your calibration once everthing is mounted permanently in the calculator case.

Locate the switch and test jack for your convenience; a thumb-actuatable position on the side of the case would work well for the switch, while the jack might be placed on the opposite side, consistent with the stuff already in your own calculator.

Error Sources

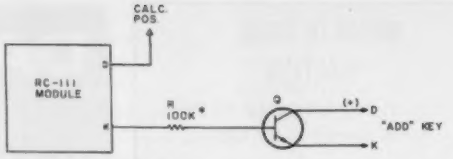
Over the 7.0-9.5-volt operating range you'll see a readout variation of about plus or minus 7%, which is quite adequate for most applications. If you wish to tighten up the precision, a zener diode with a bleed current of around 30-40 mA across the whole circuit—calculator and module—will hold variations to a couple of percent or less. This is rather tough on the battery, so an ac adapter should be considered, preferably with zener stiffening if you want to go all the way for precision. The slight error from the nature of the range capacitor dielectric has been mentioned; it's not big, but it's hard to avoid.

Real super capacitors carry a real super price tag; if you're that fussy, maybe you should send your unknown resistors to the National Bureau of Standards. Ceramics are compact and cute, but their capacity/voltage effects are impossible; forget them. If you intend to use large capacitance values for Cr in order to read low resistances, you should stick to tantalums and timing-grade types, if you can. Regular electrolytics will be quite hopeless for a good instrument. For 1000-Ohms-per-count, you'll need some 10-20 uF; for 100-Ohms-per-count, then about 100-200 uF would be required and your decade-matching problem would get a little sticky. At some level, you should best accept what your analog multimeter can deliver for the low resistance readings, to avoid fighting the uncertainties of large capacitors.

Additional Helps

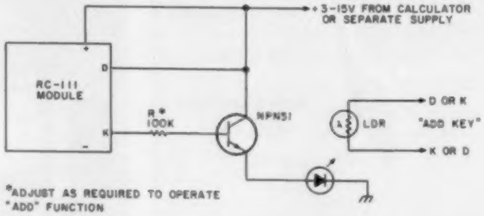
Some additional circuitry can be incorporated to make your instrument more nearly a "hands-off" machine. That is, you can avoid having to clear and enter a digit into the display by doing it electronically when you actuate the RESET/READ switch. This refinement is shown in Fig. 2 and calls for a DPDT switch in place of the SPDT switch shown in Fig. 1. The extra pole is used to send a brief pulse to the CLEAR key when you RESET and another such pulse to the 1 key when you READ. The capacitors in the transistor base legs can be ceramic for compactness, but they and the resistors in series may require a little cut-and-try for best performance. The parallel resistors across the caps can be 10-22 megohms. The series resistors need to be around .5 megohms to 1.5 megohms, depending on your particular capacitor and transistor combinations.

The object is to inject a pulse of just sufficient duration to clear the display and enter 1 at any operating voltage without fail. If the pulse is too long, the key will hang up excessively and, especially, the 1 key pulse will subtract counting time from the ADD key function and cause a low readout on your unknown resistance. Too short a pulse will be more obvious; the display will fail to clear and/or will not inject a 1 for the module to count from.



*SHOULD BE MAXIMUM RESISTANCE THAT WILL PERFORM "ADD"

Fig. 3. Circuit for boosting module output for certain calculators (as needed).



*ADJUST AS REQUIRED TO OPERATE "ADD" FUNCTION

Fig. 4. Optically coupling module circuit to calculator.

Since the symptoms of erroneous choices are self-evident, it isn't too hard to land on the right combination. The series resistances should be on the high side to avoid ghosts in the display and excessive voltage on the transistor bases. The transistors can be just about any cheap silicon general-purpose units, the smaller the better. Once you have this circuit improvement squared away, the RESET/READ switch should do everything for you and prevent wear and tear on the fingertips.

Experimental Section

Other brands of calculators can be made to yield to this circuit scheme, but you may find that they have slightly different or perhaps more recalcitrant characteristics. Some appear to require a heavier current to actuate the keys, as evidenced by requiring a lower jumper resistor to do the job from the circuit side of the box. A boosted output for the module can be provided by a transistor in such a case, as shown in Fig. 3. In this case, the module D lead should be tied to the positive supply rail.

In calculators which have the necessary constant-add function performed by a third key (requiring, say, a CLEAR—1—ADD sequence followed by repeats on an EQUALS key, for instance), you still have the option of either entering the three initial keys and letting the module drive the EQUALS key or using the DPDT switch arrangement on the 1 and ADD, but leaving your finger to do the clearing. Again, the low-resistance keying problem might be present, which generally would result in three transistors being used for this arrangement.

Finally, if you have been intrigued by all the talk about opto-couplers, this project might be a useful place to start playing. Going back to the simple case of the module actuating the ADD key, you can produce this more exotically by shunting the key leads with a suitable light-dependent

QUALITY parts at DISCOUNT PRICES!

4 CHANNEL 8 TRACK HOME UNIT

BRAND NEW UNITS... ASSEMBLY INCLUDES; TAPE HEAD, MOTOR BELT, 110VAC MOTOR, PRE-AMP, LIGHTS, SWITCHES, SOLENOID AND OTHER USEFUL PARTS.... AN EXCEPTIONAL BUY!

$7.25 PER ASSEMBLY

4PDT RELAY

- 14 pin style
- 3 amp contacts
- 24 volt d.c. or 120 volt a.c. coil
- Used but fully tested

$1.70 EACH
specify coil voltage
LARGE QUANTITIES AVAILABLE
SOCKETS FOR RELAY 50¢ each

FOUR TERMINAL CONNECTOR

$1.50 PER SET
WEATHER-PROOF, MOLDED SOCKET, CONNECTOR SET.

3 TERMINAL CONNECTOR

CONNECTOR SET, SIZE: 5/8" LONG 1/8" WIDE, 1/4" DEEP NOT INCL. PIN LENGTH...
75¢ A PAIR

MINI SIZE BUZZERS

1½ to 3 volts 75¢ ea WITH WIRE LEADS
1½ to 3 volts 75¢ ea WITH PIN TERMINALS
3 to 7 volts WITH PIN TERMINALS 75¢ each

JOYSTICK

PRECISION DEVICE... CONTAINS 4 50K CENTER TAPPED ALPS POTS......
$4.75 each

MITSUMI
MODEL UES-A55F
VARACTOR UHF TUNER

FREQ RANGE 470 - 889 MHZ
ANTENNA INPUT 300 OHMS
$25.00 each
10 for $220.00

FLAT LEVER MINI-TOGGLE
SPDT (ON-ON)

5 AMP @ 120 VAC
C&K # 7105
$1.00 EACH
10 for $8.50
100 for $75.00

SEND FOR NEW 1982
Free! 40 PAGE CATALOG Free!

COMPUTER GRADE CAPACITOR

1700 mfd. 150VDC $2.00
2 1/2" DIA X 4 3/4" HIGH
3,600 mfd. 40VDC $1.00
1 3/8" DIA. X 3" HI
6,400 mfd. 60VDC $2.50
1 3/8" DIA X 4 1/4"
12,000 mfd. 40 VDC $3.00
2" DIA X 4 1/4" HIGH
18,000 mfd. 75 VDC $4.00
2 1/2" DIA X 4 1/2" HIGH
20,000 mfd. 25 VDC
2" DIA. X 2½" HIGH $2.00
22,000 mfd. 15 VDC
2" DIA X 2 1/2" HIGH $2.00
22,000 mfd. 40 VDC
2" DIA. X 6" HIGH $3.00
25,000 mfd. 75 VDC $4.50
3" DIA X 4 3/8" HIGH
45,000 mfd. 25 VDC
2" DIA. X 4" HIGH $3.50
72,000 mfd. 15 VDC
2" DIA. X 4" HIGH $3.50
CLAMPS TO FIT CAPACITORS 50¢ ea

L.E.D.'s
STANDARD JUMBO DIFFUSED

RED	10 FOR $1.50
GREEN	10 FOR $2.00
YELLOW	10 FOR $2.00

FLASHER LED
5 VOLT OPERATION
JUMBO SIZE
2 FOR $1.70

BI POLAR LED
2 FOR $1.70

SUB MINI LED
.079" X .098"
20mA at 1.75v
10 FOR $1.00
200 FOR $18.00
QUANTITY PRICES AVAILABLE

CANNON XLRA-3-13 CONNECTOR

3 PRONG CHASSIS MOUNT CONNECTOR
$2.00 EACH
10 for $19.00

SUPER SMALL PHOTO-FLASH
170 MFD 330 VOLT
1 ¼" x ⅞"
2 for $1.50
10 for $7.00

BLACK LIGHT (ULTRAVIOLET)
G.E. # F6T5BL $2.50 each

750 MFD 330 V PHOTO FLASH
2" HIGH X 1 1/4" DIA
$1.25 EACH
10 FOR $11.00

TRANSFORMERS
120 volt primaries

6 VOLTS at 150 mA	$1.25
12 V.C.T. at 500 mA	$2.50
16.5 V. at 3 AMPS	$6.50
18 VOLTS at 1 AMP	$4.50
25.2 VCT at 2.8 AMP	$5.50

2' DIA. 1½VDC
BUZZER SPECIAL!
50¢ each
10 for $4.00
100 for $35.00

2" ALLIGATOR CLIPS
7 clips for $1.00
100 clips for $12.00
500 clips for $50.00

SPECIAL **MRF 901**
MICROWAVE TRANSISTOR
$2.50 EA.

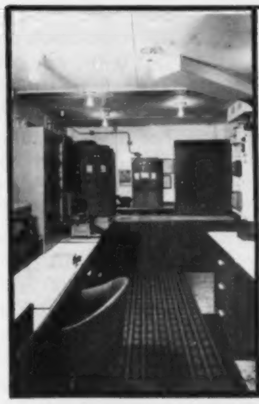
ALL ELECTRONICS CORP.

905 S. Vermont Ave.
P.O. BOX 20406
Los Angeles, Calif. 90006
(213) 380-8000

Mon. - Fri. 9 AM - 5 PM
Saturday 10 AM - 3 PM

TERMS
- Quantities Limited
- Min. Order $10.00
- Add $2.50 Shipping USA
- Calif. Res. Add 6%
- Prompt Shipping

20



RADIO STATIONS COMMON? NOT THIS KIND is a history of communications commencing with the first visual systems, terminating in a brief description of the electronics fitted in the modern merchant ship, and centered around the largest marine radio station in Canada, Halifax Radio VCS. As a member of the Royal Canadian Navy, Metro Goldwyn Mayer Inc., Air Services Branch Department of Transport, Gypsum Transportation Ltd., Royal Canadian Mounted Police, and Canadian Coast Guard, Mr. Roscoe has enjoyed twenty-five years as a radio operator. He operates Amateur Radio Station VE1BC and is an active member of Society of Wireless Pioneers, Veteran Wireless Operators Association, Canadian Amateur Radio Federation, Nova Scotia Amateur Radio Association, Kings County Amateur Radio Club, American Radio Relay League and World Ship Society. Anyone with an interest in Amateur Radio, Ship Radio Stations, Commercial Radio Operating, Telegraphy, Aircraft, Ships, or Nova Scotia, should find this book interesting and informative. **Reserve your copy now. Send no money at this time. You will be notified of the shipping date, and will be billed at that time.**

S.G. Roscoe, Box 1, Site 5, R.R.#5, Armdale, Nova Scotia. Canada B3L 4J5, (902) 868-2343. 95

New Automatic Antenna Tuner Auto-Track AT 2500

Designed and Built by J. W. Miller Div.

Check these state-of-the-art specifications

- Power Capability: 2500 W PEP.
- Frequency Range: Continuous 3.0 to 30 MHz (Including WARC Bands).
- Impedance Matching: 10 ohms to 300 ohms to 50 ohms resistive.
- Direct Reading SWR Meter: 1:1 to infinity.
- Direct Reading Power Meter: Two meter scales from 0 W to 250 W and 0 W to 2500 W; front panel switch selects FWD or Reflected Power *(illuminated panel meters)*.
- Power meter displays RMS with continuous carrier and automatically displays PEAK when driven with SSB signal.
- Average "Automatic" tune-up time: seconds or less.
- Tune-up time not affected by power leve can be as low as 1 W (5-10 W preferred).
- Power requirements are 115/230 VAC 50-Hz, 10 W operating/5 W standby; or 13 VDC, 1 A operating/.5A standby.
- Antenna tuner packaged in cabinet 17"W x 5¾"H x 14"D (Front panel handles or rack mount optional at extra cost.)

Write for literature.

Specifications subject to change without notice.

Dealer Inquiries Invited

308

J. W. Miller Division
BELL INDUSTRIES
19070 REYES AVE. ■ P.O. BOX 5825
COMPTON, CALIFORNIA 90224
Phone (213) 537-5200

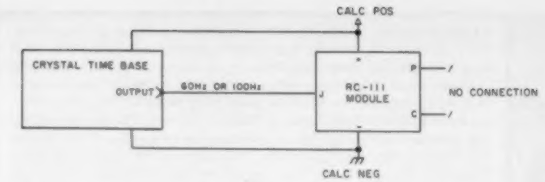


Fig. 5. Use of crystal timebase for high-precision ohmmeter and timer/stopwatch functions.

resistor (LDR) facing an LED operated by a transistor-boosted output from the RC-111 module as shown in Fig. 4. This scheme gives you a lot of potential design freedom, because the only necessary connection between the module circuit and the calculator can be a light beam. Consequently, if the gods and what-not are in your favor, you can operate the module on one battery (by itself, it only consumes a couple of milliamps, and only while counting) while the calculator operates on its own original supply, which can then include those situations beyond the 3-15-volt requirements of the module.

There are two precautions. First, the LDR has to act with reasonable speed in crossing from low resistance (to actuate the key) while illuminated by the LED to high resistance (for about an equal time) to let go of the key. Second, the LED has to be able to light the LDR sufficiently to effect the necessary low resistance, which means that it may require a pretty good-sized jolt of current to do the job. So, a satisfactory functional matching of LDR and LED is necessary and requires a little horsing around to get things just right.

Some LDRs are rather slow, and this might mean sacrificing some counting speed to incorporate this design. On the other hand, you may hit fat city and find that, for example, a fast and cheap photo-diode or photo-Darlington transistor will work just fine in your situation. Then you're home free. But you see why I entitled this part as an experimental section. As a hobbyist, you should be allowed to feel intrepid. On the other hand, I am obliged to state the disclaimers. I have to disclaim any responsibility for what you may do on your own hook. Fortunately, I have found so far that most calculators are very forgiving about all the rooting around in their guts.

Some Freebies

A number of non-ohmmeter possibilities may have become apparent by the time you have read this far. Yes, the module/calculator combo makes a pretty dandy and simple counter or timer or stopwatch, with or without the ohmmeter function. The timing will continue *ad nauseum* as long as module lead S is tied or switched to the positive supply rail and stop when it is on the negative rail. A second timing pot could be switched in to produce a timing speed more attuned to your needs.

Almost any calculator candidate should run fast enough to count by seconds; most will count by tenths, and some will make it to .01-second-per-count or beyond. For your own needs you might want to consider hundredths of minutes or even milli-hours or the like. Astronomers might even want to shoot for microsidereal-day time, in an extreme case. Although not crystal controlled, the precision is not bad with reasonable voltage regulation and can be set with an oscilloscope against multiples or submultiples of the 60-Hz line. For the calculator chips that can reach to 60 Hz or 100 Hz, one of the cute little boards that provides such with crystal control can be purchased for around $5.00 and run from most calculator power supplies. The output can be tied to the module as shown in Fig. 5, connected to the J lead while the P and C leads are left open.

Once you can measure Ohms digitally, you also can measure the ohmic relationships of other devices, of course. Therefore, this means that you can establish a relationship with light and temperature, to cite the most obvious examples. The aforementioned LDRs can be used to measure light, and at extremely low levels. So can a whole raft of other devices: photo-diodes, photo-transistors, and even plain LEDs. In these cases, the lower the light level, the higher the reading displayed, and if you have a big range capacitor, it might take minutes for the display to stop running if it is dutifully trying to count all the hundreds of megohms an LDR can reach at low light levels.

For this application I have found that a tiny 220-picofarad range capacitor worked about right for modest but useful counts when making enlargements in my darkroom. Because of the inverse light/count relationship, this combination is more properly a dark-meter, but that's beside the point. In effect, it reads out a number proportional to the right exposure . . . that's the bottom line in the photographic application. The LDR could optionally be connected to replace the timing pot (Rt) with a fixed combination of Cr and Rx chosen to time for a few seconds. In such a case you would get a reading that increased as the light intensity increased; however, in too-bright light, the calculator chip counting rate would be exceeded and the display would show funny results. With the LDR as Rx in the ohmmeter circuit, the excessive light intensity would register only your originally-entered 1 and would create less confusion.

A precaution about LDRs: As well as being a little slow, they have varying degrees of memory, so they don't immediately settle down on the first reading after a shift in light level. The fastest ones get there well enough to be extremely useful, but you would detect the discrepancy on a succession of readings. Thermistors are decidedly non-linear, and it takes some extra fooling around with the circuitry to get them to put out real temperature readings over a useful span. Ideally, you would fortify yourself with a calibration curve, or "normalize" the application.

If, for instance, you want to display a single photo-developer temperature digitally, and always use that temperature, the thermistor/range capacitor combination could be made to display "100" at the chosen temperature, from which you could empirically set acceptable limits from this value to suit the precision requirements for your needs.

Hams develop other situations for themselves in which a digital display of the results could be useful. An azimuth readout could be provided for an antenna, for example, by tying a suitable pot to the rotating antenna shaft as the Rx generator and scaling the display relationship to read out the number of degrees representing the direction. Or, with a linear pot as the unknown, you could make a digital micrometer of sorts. The mind boggles at the prospects.

Perhaps the most immediately useful takeoff on the ohmmeter is the alternative of making the range capacitor the unknown and scaling with resistors in the Rx position to provide a few decades of readability. A megohm or two will give a display in microfarads to two decimal places. A commensurately longer string of resistors can enable you to reach to 100-picofarads-per-count and read microfarads on the same scale to too many decimal places to be of practical interest—and taking that much more time to count, as well.

The switching requirements to make a combined ohmmeter/capacimeter are not horrendous, but to do a really good job, you would want to consider a bigger case to accommodate range switching. If you have a dead-keyboard calculator to start with, perhaps try putting in a huge LED display in place of the usual small one. With commercial capacimeters selling for about ten times the cost of the Kaltek module, you can do almost as much (except for the teeny capacitances) and have the advantages of the digital ohmmeter in the bargain.

Conclusion

I could go on and on until the applications for the RC-111 module were limited by my imagination. But it seems fitting to leave off as above and tell you that the applications are limited by your imagination. In any event, this little device has a truly impressive cost-benefit ratio, and I'm confident that you'll flip over it.■

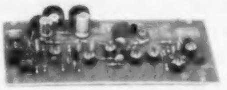
FAST SCAN

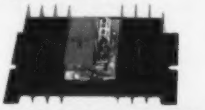
*$249

A modular approach...for your own custom-designed ATV system....Here's how

TXA5-4 ATV EXCITER/MODULATOR.$89 ppd

This wired and tested module is designed to drive the Motorola MHW-710 module in the PA5 10 watt linear amp. The crystal in the 100 mHz region keeps harmonics out of two meters for talk back. The video modulator is full 8 mHz for computer graphics and color. Requires 13.8 vdc reg @ 70 ma. Tuned with xtal on 439.25, 434.0, or 426.25 mHz. Provision for sync expanding. Two frequencies available.





PA5 10 WATT ATV POWER MODULE $89 ppd

The PA5 will put out 10 watts RMS power on the sync tips when driven with 80 mw by the TXA5 exciter. 50 ohms in and out, plus bandwidth for the whole band with good linearity for color and sound. Requires 13.8 vdc regulated @ 3 amps.

FMA5 AUDIO SUBCARRIER GENERATOR ....$29 ppd

Puts audio on with your camera video just as broadcast TV does at 4.5 mHz. Puts out up to 1 v p-p to drive the TXA5 or VM-2, 3, or 4 modulators. Requires low Z mic (150 to 600 ohms), and +12 to 18 vdc @ 25 ma. Works with any xmtr with 5 mHz video bandwidth.

TVC-2 ATV DOWNCONVERTER....$55 ppd

Stripline MRF901 (1.7 db NF) preamp and double balanced mixer module digs out the weak ones but resists intermods and overload. Connects between uhf antenna and TV set tuned to channel 2 or 3. Varicap tunes 420 to 450 mHz. Requires +12 to 18 vdc @ 20 ma. Super sensitive TVC-2L with NE64535 preamp (.9db NF) stage...$69 ppd.

***TXA5, PA5, FMA5 and TVC Basic Module Pkg.**

Call or write for our complete list of specifications, station set-up diagrams, and optional accessories which include antennas, modulators, detectors, test generators, cameras, etc. **WE ARE A FULL-LINE SUPPLIER OF ALL YOUR ATV NEEDS.**

TERMS: VISA or MASTER CARD by telephone or mail, or check or money order by mail. All prices are delivered in USA. Allow three weeks after order for delivery.

(213) 447-4565 Charge card orders only

P.C. ELECTRONICS 2522 Paxson Lane,
Tom W6ORG Maryann WB6YSS Arcadia, California 91006

The places to buy ARCO Solar™ Power Systems are popping up everywhere.

For some very sound reasons. Not all solar electric systems are created equal. ARCO Solar products offer all the features that add up to superior performance and increased value. Features like design, construction, warranty, accessories and service. Those who know what dependable, stand-alone power can do for their communications equipment, know how important these features are.

And now, there are 2,500 dealers across the United States and Canada offering ARCO Solar power systems. For the name of the dealer nearest you, contact one of our regional distributors:

DENVER, CO
C.W. Electronic Sales
(303) 832-1111

LOS ANGELES, CA
Henry Radio
(213) 820-1234

DALLAS, TX
Hutton Companies
Dallas (214) 484-0580
Texas (800) 442-3811
Outside (800) 527-0627

NORTH HOLLYWOOD, CA
Wm. Lamb Company
(213) 980-6248

LENEXA, KS
North Supply Company
(913) 888-9800

SCOTTSDALE, AZ
Photocomm
(602) 948-8003

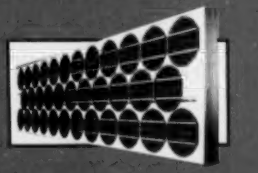
HONOLULU, HI
Servco Pacific Inc.
(808) 841-3644

WILLITS, CA
Solar Electric Specialties
(707) 459-9496

SANTA BARBARA, CA
Solar West Electric
(805) 963-9667

CALGARY
ALBERTA CANADA
Westronics Engineering
(403) 253-5585

*ARCO Solar, Inc HR-4-82



ARCO Solar, Inc.
Subsidiary of AtlanticRichfieldCompany

121

James L. Campton N7AAD
3001 South 288th, #182
Federal Way WA 98003

Scanning with the IC-280

How many times have you seen a nifty circuit that would expand the capability of your operation only to be stopped cold by the thought of drilling holes or otherwise performing cosmetic surgery on your shiny new rig just to mount controls for the additional function? Here is a scanner that uses existing switches, costs about $25 maximum, and mounts inside the control head.

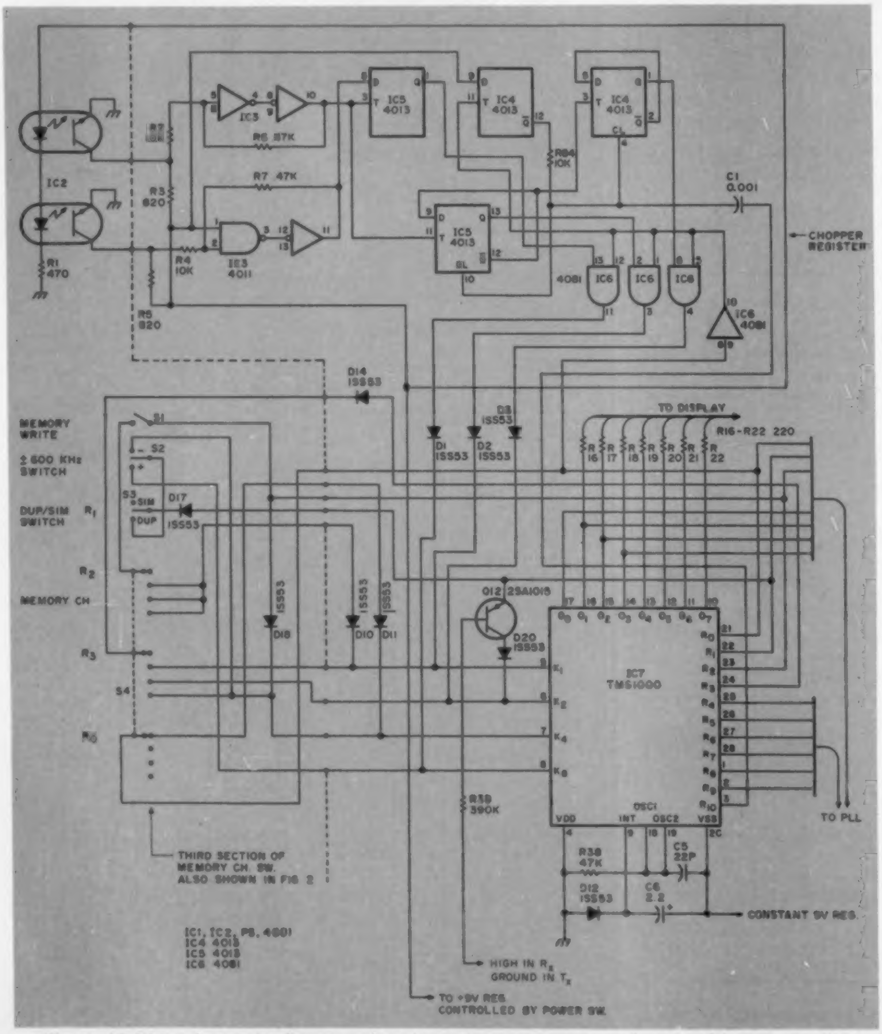

IC2
R1 470
R3 820
R4 10K
R5 820
R6 57K
R7 47K
IC3
IC3 4011
IC5 4013
IC4 4013
R84 10K
C1 0.001
CHOPPER REGISTER
4081 IC6
IC6 4081
D14 1SS53
MEMORY WRITE
S1
S2
±600 KHz SWITCH
S3 SIM DUP
D17 1SS53
DUP/SIM SWITCH
R1
R2
MEMORY CH
R3
S4
R0
D1 1SS53
D2 1SS53
D3 1SS53
D18 1SS53
D10 1SS53
D11 1SS53
TO DISPLAY
R16-R22 220
Q12 2SA1015
D20 1SS53
IC7 TMS1000
K1 K2 K4 K8
O0 O1 O2 O3 O4 O5 O6 O7
R0 R1 R2 R3 R4 R5 R6 R7 R8 R9 R10
VDD INT OSC1 OSC2 VSS
TO PLL
R39 390K
R38 47K
D12 1SS53
C5 22P
C6 2.2
CONSTANT 9V REG.
THIRD SECTION OF MEMORY CH. SW. ALSO SHOWN IN FIG 2
IC1, IC2, PS. 4801
IC4 4013
IC5 4013
IC6 4081
HIGH IN Rx GROUND IN Tx
TO +9V REG CONTROLLED BY POWER SW.

Fig. 1. IC-280 schematic diagram showing microprocessor and control input circuitry.

Two-meter transceivers as a class have been trending towards the low current drain of CMOS control circuitry, notably synthesizers and attendant display circuits with external control capability. The earliest example of this type of transceiver in the Icom line was the IC-22S which, for the first time, offered hams the ability to interface their rigs with a wide variety of hardware. Since then, several advances have been made, the latest of which incorporates a microprocessor into the control function.

Before proceeding further, one point should be emphasized. The microprocessor in the IC-280's control head resembles less a hobbyist's computer system (8080, 6800, Z80, etc.) and more the type found in a calculator. The chip is from Texas Instruments' TMS 1000 series of microprocessors which have all RAM and ROM in the same package and cannot access external memory of any kind. The ROM is mask-programmed at the factory and cannot be changed.

Nevertheless, it offers enormous flexibility (from the designer's point of view) in that it can be tailored for any type of control function in any type of system that can be imagined.

Flexible for the engineer but pretty well set for the user, right? Well, not quite.

The secret of enhancing the control capability of such a system lies in the realization that while the microprocessor is programmed for a limited number of control functions, these same functions need not be accessed via mechanical switches but electronically instead, upon command of other signals within the transceiver. In short, it is very easy to cause the radio to tell itself what to do.

	Data Input Lines			
Strobe/Function	**K1**	**K2**	**K4**	**K8**
When dial is selected and RO is positive	N/C	N/C	High	N/C
R1 is the sim/dup strobe. When it is high and the dup. function switches are set, the following occurs	N/C	High if dup and in Tx	High if −600 kHz	High if +600 kHz
With memory-write switch depressed and R2 high	High	N/C	High regardless of memory write	N/C
If R3 is high and the memory-channel switch is set as follows:	High if Ch. 1	High if Ch. 2	High if Ch. 3	N/C

Table 1. Input data codes for microprocessor IC-7 in the IC-280 control head.

Theory of Operation

To understand how the scanner works, it is necessary to describe how data gets entered into the microprocessor.

The type of input used is called a scanning matrix. Basically, this means that there are just four lines (K_1, K_2, K_4, K_8) where information will go into the chip. However, due to internal circuits, the data input lines accept only certain types of information at certain times. These times coincide with a high R strobe, only one of which is positive at any given time.

For instance, of the four strobe lines we are interested in (R_0-R_3) for data input, we will assume that the R_0 strobe has just gone high, or positive. Strobes R_1-R_3 then are at a low, or ground potential. For the period of time that R_0 is high, the data lines K_1, K_2, K_4, and K_8 are interested only in data from the optical chopper register. This data will cause the frequency to increase, decrease, or remain unchanged and is updated at the strobe rate of about 125 pps (pulses per second).

Referring to the IC-280 control-head schematic in Fig. 1, it can be seen that the data lines are physically connected to a variety of switches and circuits. The reason that data from the chopper register is not garbled by these other components is that the common contact of each switch is connected to the strobe appropriate to its function. When the R_0 line is high and all other strobes are low, each low strobe is prevented from sinking current or pulling down voltage on the lines by means of a blocking diode.

When the R_1 line goes high, only data corresponding to that strobe is generated. Next, the R_1 strobe goes low and R_2 goes high, and so on. The function of each line in the matrix is listed in Table 1.

The scanner-module schematic is shown in Fig. 2. The switch section at the bottom of the diagram is the last section of the channel-select switch (see Fig. 1). The common contact normally connected to the R_0 strobe is now connected to the power switch through a resistor, R29. This allows the use of the switch section to select the dial mode in either the D or CH 3 positions by using analog switch S1 to perform the previous function of the channel switch. Thus, when the D position is selected, the transceiver operates normally.

However, with suitable modifications to the other two sections of the channel switch in the CH 3 position, the voltage now available from the last section in the CH 3 position is used to turn on analog switch S2 in the scanner, allowing pulses to pass through it. Analog switch S3 is normally turned on in the receive mode and will allow pulses from analog switch S2 to go to the chopper circuit. S3 is turned off in transmit, preventing scanning.

In the scanning position, a positive voltage is connected to pin 4, IC5 in the control head, which is the RESET input for the up/down flip-flop in the optical chopper circuit. Since the voltage causes the Q output to be forced low, the microprocessor always counts down.

To make the scanner count up, the SET line must receive the positive voltage while the RESET line is grounded. However, the scanner's performance is the same in either mode and it is easier to wire the IC to count down.

When the 280 receives a signal, a dc voltage imposed on the audio line is transmitted from the squelch circuit to the base of Q11, causing its collector to be grounded. The receive LED whose cathode is connected to the collector of Q11 is then lit. The collector of Q11 is also connected to terminal 11 of the scanner which in turn is connected to pin 12 of IC3, the input on a NAND gate. If pin 13, the other input to the NAND gate, is high, then the output on pin 11 will go to ground. A negative spike is then generated by C_4 and R_7 and is used to trip the monostable multivibrator which consists of two NOR gates from IC1 and C5 and R8, whose time constant will roughly determine the length of pause on an occupied channel. The values shown will yield about 9 seconds. R8 can be decreased to 50k Ohms to generate shorter pause times.

When the monostable is tripped, pin 10 of IC1 goes to ground, which pulls down the control line of analog switch S2 through D4. This action stops the pulses going to the chopper circuit, and the transceiver will stay on the channel until the one-shot resets.

The monostable circuit will not respond to further trip pulses on its input after the original spike so that the practical result is for the scanner to stop for a fixed length of time on an occupied channel no matter how many times the squelch is broken.

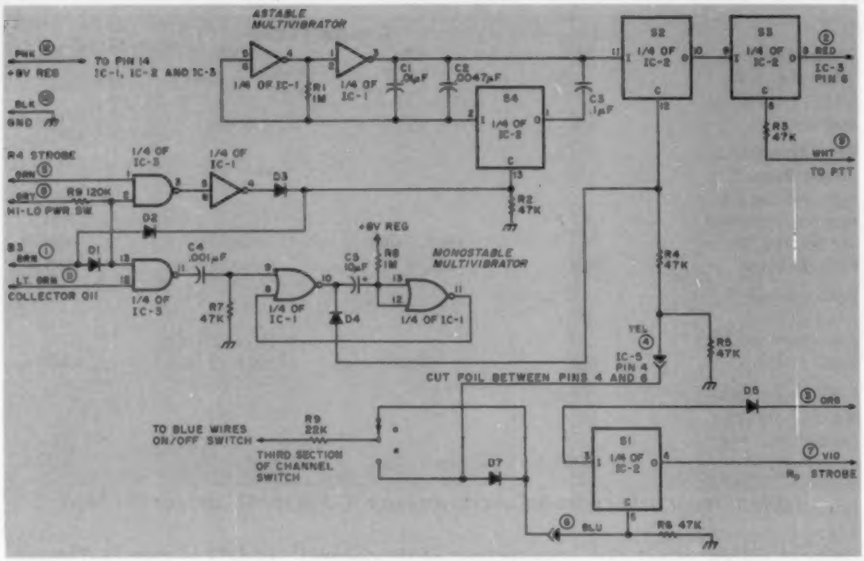
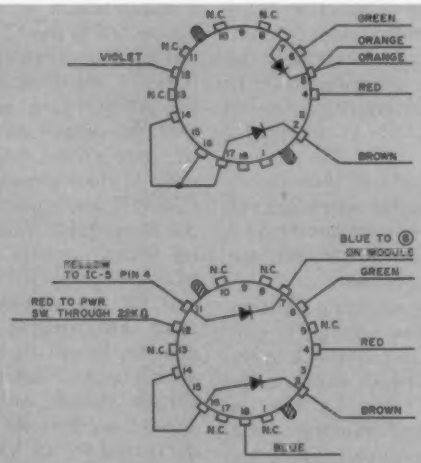

ASTABLE MULTIVIBRATOR
PNK ⑫
+8V REG
TO PIN 14 IC-1, IC-2 AND IC-3
BLK ⑬
GND
1/4 OF IC-1
R1 1M
C1 .01µF
C2 .0047µF
S4 1/4 OF IC-2
C3 .1µF
S2 1/4 OF IC-2
S3 1/4 OF IC-2
② RED
IC-3 PIN 6
R3 47K
⑨ WHT
TO PTT
R4 STROBE
ORN ⑤
GRY ⑧
R9 120K
HI-LO PWR SW
1/4 OF IC-3
D3
D2
R2 47K
+8V REG
B3
BRN ①
D1
LT GRN ⑪
COLLECTOR Q11
C4 .001µF
R7 47K
C5 10µF
R8 1M
MONOSTABLE MULTIVIBRATOR
D4
R4 47K
YEL ④
IC-5 PIN 4
R5 47K
CUT FOIL BETWEEN PINS 4 AND 6
D6
③ ORG
TO BLUE WIRES ON/OFF SWITCH
R9 22K
THIRD SECTION OF CHANNEL SWITCH
D7
S1 1/4 OF IC-2
⑦ VIO
R₉ STROBE
⑥ BLU
R6 47K

Fig. 2. Scanner module schematic.


N.C.
GREEN
ORANGE
ORANGE
VIOLET
RED
BROWN
BLUE TO ⑥ ON MODULE
YELLOW TO IC-5 PIN 4
RED TO PWR SW THROUGH 22KΩ
BLUE

1-4 No change.
5 Remove cathode of diode. Remove 2 orange wires and splice with orange wire from module. Leave this tab unconnected.
6 No change.
7 Remove anode of diode (its cathode was removed from tab 5). Install cathode of new diode and blue wire from module.
8-10 No change.
11 Connect the yellow 6" wire (not from the module) and anode of the diode whose cathode was connected to tab #7.
12 Remove violet wire and splice to violet wire from module. Install the 3" red wire (goes to power switch through 22k).
13-15 No change.
16 Remove anode of diode connected to tab 17 and connect it to this tab. This will leave tab 17 unconnected.
17 See tab 16.
18 No change.

Fig. 3. Channel switch pictorial and modification instructions (rear view).

The astable multivibrator, whose output is fed to analog switch S2, has two speeds selected by analog switch S4. When S4 is on, more capacitance is connected in parallel with C2 and C3, lengthening the time constant and lowering the output repetition rate. When S4 is off, the repetition rate increases.

The reason for the two pulse rates is that in the 146-148-MHz portion of the band, the set tunes in 15-kHz steps, and the 143-145.99-MHz portion tunes in 5-kHz increments. To keep the time spent in the lower portion of the band more or less equal to that spent in the upper portion, the scan rate must increase. The fastest scan rate is used if one is not interested in the lower portion of the band; a more moderate speed is used to detect occupied frequencies below 146 MHz, and 146-148 MHz are always scanned at the same rate.

If one wishes to receive signals in the 143-145.99-MHz range, two contradictory problems are apparent. First, if the scan rate is too fast, the scanner will not reliably stop on frequency—if it stops at all. If the rate is slow enough to stop reliably, the unit will spend a much greater period of time in a portion of the band which is relatively unused. The solution is to connect NAND gates, one of which is used as an inverter, to terminals 5 and 8 of the scanner and turn analog switch S4 on or off, depending on the state of the inputs.

Terminal 5 of the module is connected to the R4 line which is low when the kHz digit is 5 and high when the digit is 0. If the Hi/Lo power button is pushed in, terminal 8 is high. This means that analog switch S4 will be off when the kHz digit is 5 and the astable will have a high repetition rate. When the kHz digit is 0, the astable will take a longer time to change state. Therefore, a minimum time is spent on frequencies ending in 5 kHz and a maximum time on all others when below 146 MHz.

If terminal 8 is grounded (Hi/Lo button out), the scanner will be in the high-scan rate all the time unless terminal 1 goes high and turns on analog switch S4 through D2, slowing the scan rate. Terminal 1 is connected to the B$_3$ line (R$_8$ line from IC7) which goes high from 146 MHz to 148.11 MHz. The connection between pins 2 and 13 of IC3 on the module ensures that if terminal 8 is grounded, squelch breaks will not stop the scanner below 146 MHz, but will pause appropriately above 146 MHz.

Construction

Construction of the single-sided PC board is rather straightforward, and the foil layout is shown in Fig. 4. Wire color is specified in the schematic in Fig. 2, and component layout in Fig. 5. Tolerances are not critical; however, the components specified in the parts list fit the PC board. Since the

AEA . . . FIRST IN

- INNOVATION
- QUALITY DESIGN and CONSTRUCTION
- RELIABILITY
- SERVICE

AEA INVITES YOU TO SEE OUR PRODUCTS AT QUALITY DEALERS THROUGHOUT THE U.S. AND CANADA.

FOR DETAILED INFORMATION ON OUR PRODUCT LINE CONTACT ADVANCED ELECTRONIC APPLICATIONS, INC., P.O. BOX 2160, LYNNWOOD, WA 98036. CALL 206/775-7373.

AEA Brings you the Breakthrough!

✓2

SHEET METAL WORKERS

TRIOK

MULTI-PURPOSE
- SHEAR
- PRESS BRAKE
- SLIP ROLL

ALL FUNCTIONS OPERATE SIMULTANEOUSLY

THE COMPLETE R&D SHOP
- 24" wide • 257 lbs.
- 20" ga. capacity mild steel or
- .050/.060" ½ hard aluminum
- punches, special dies, stand available as accessories

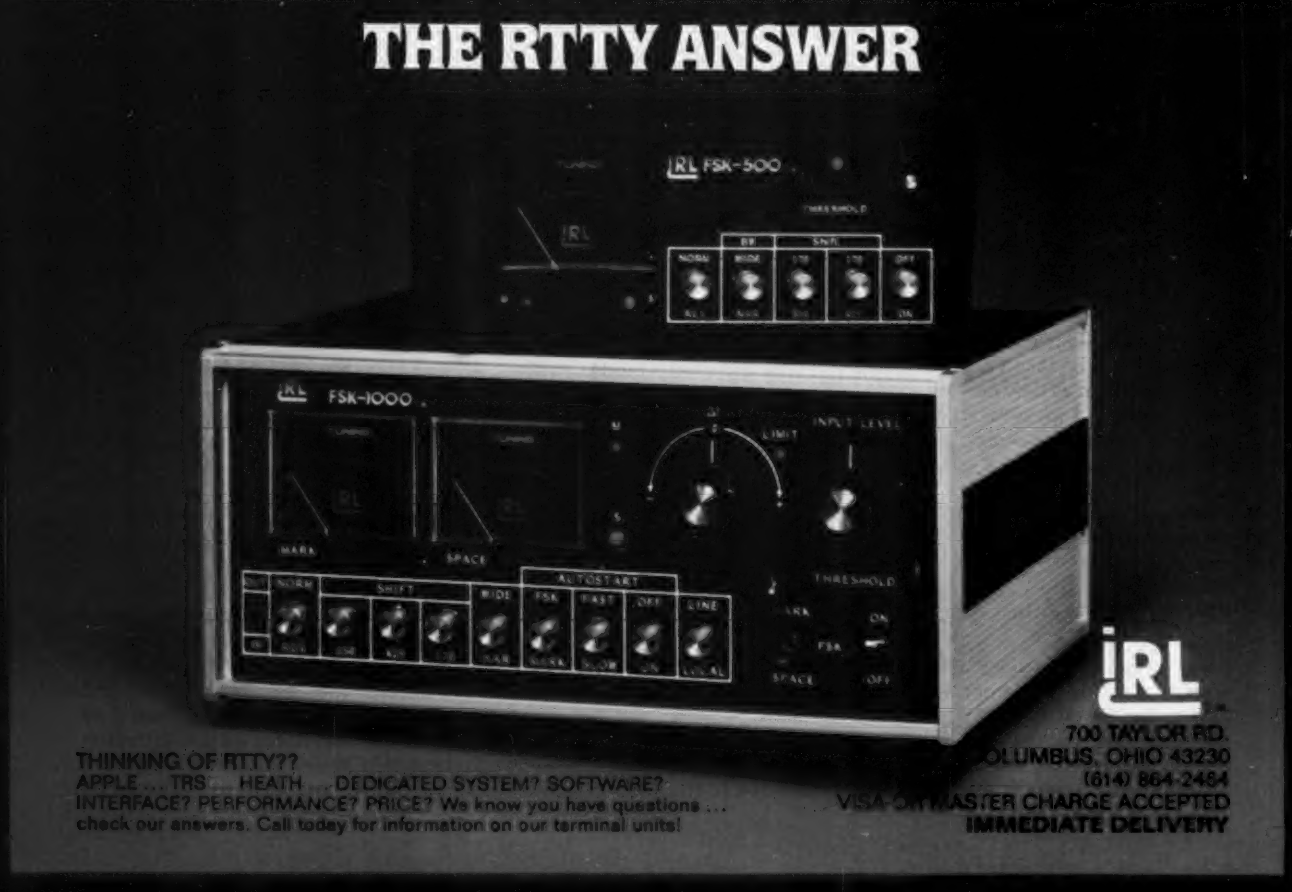
SHEAR-NOTCHER

NO DISTORTION • NO BURRS
- continuous shearing
- corner notching
- tab notching
- nibbling

$58.50
plus $4.00 shipping

✓113
Send for your FREE literature and SHEET METALWORKER BULLETIN

PACIFIC ONE CORPORATION
410 W. Pacific Coast Hwy. Suite K 204
Newport Beach, CA 92663 (714) 645-5962



THE RTTY ANSWER

THINKING OF RTTY??
APPLE . . . TRS . . . HEATH . . . DEDICATED SYSTEM? SOFTWARE? INTERFACE? PERFORMANCE? PRICE? We know you have questions . . . check our answers. Call today for information on our terminal units!

IRL
700 TAYLOR RD.
COLUMBUS, OHIO 43230
(614) 864-2464
VISA OR MASTER CHARGE ACCEPTED
IMMEDIATE DELIVERY

module is installed component side down, hookup wires should come out on the component side of the board. Assemble the PC board before proceeding.

Tools required to install the module are a #1 Phillips screwdriver, a #2 Phillips screwdriver, a 5/64" hex wrench, a 40-Watt soldering iron, preferably the controlled-temperature type, a pair of diagonal cutters, and a pair of long-nose pliers.

Step 1—Disassembly of the Control Head

a) First, remove the control head from the main unit.

b) Next, remove the plastic cover of the control head held by four dark screws.

c) Take out the four smaller screws holding the speaker assembly and remove it, taking care not to damage the wires connecting it to the set.

d) To remove the plastic front panel cover, remove the two side brackets which are held with two dark screws each.

e) Then remove the four lighter screws securing the flange of the cover to the metal frame.

f) Using the hex wrench, loosen the setscrew holding the frequency knob and remove the knob.

g) The volume, squelch, and channel knobs pull off, but care must be taken not to scratch them as they normally require a great deal of force before they come off. Be sure not to lose the brass ring under the memory-channel knob. The plastic cover will now come off.

Step 2—Rewiring the Channel-Selector Switch

a) To get at the switch easily, remove the two light screws securing the front half of the metal frame to the rear half, on the side next to the switch. Use a #2 Phillips-head screwdriver and be careful not to strip the heads of the screws, which are generally quite snug. This is the only side to be loosened.

b) Noting their position first, desolder the two bare wires connecting the mike jack to the PC board.

c) Now slide the frame apart enough to allow clearance for the switch which is then removed from its hole through the top of the unit.

d) Referring to the switch diagram in Fig. 3, change the wiring so that it is the same as the "after" picture, following the instructions given. A new diode will have to be used in place of the one removed as its leads are too short. A 1N4148 or equivalent silicon diode may be used. The red and yellow wires on the module are not the yellow and red wires to be installed on the switch.

e) Re-install the switch, re-connect the frame, and re-solder the wires from the mike jack. Check the terminal with the yellow wire to be sure it does not short to the frame.

Step 3—Installing the Module

a) Locate IC5 in Fig. 6 and note the location of an X on the PC land connecting pins 4 and 6. Cut this land (which is on the bottom side) and solder the yellow wire from the switch to pin 4.

b) The red wire installed on the channel switch is connected to the blue wires on the power switch through a 22k-Ohm resistor. The power switch is located on the rear of the volume pot.

c) The violet wire, formerly attached to the channel switch, is spliced with the violet wire on the module as explained in step 12, Fig. 3. The splice is covered with heat shrink to prevent shorting.

d) The two orange wires no longer connected to the switch are spliced with the orange wire from the module as stated in step 5, Fig. 3.

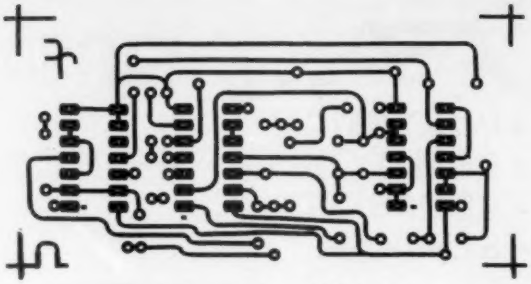


Fig. 4. Scanner board PC layout.

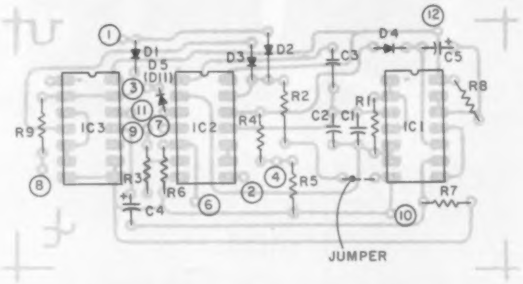


Fig. 5. Scanner board component placement.

e) All remaining wires from the module except the gray one are soldered at the points indicated in the control-head component layout of Fig. 6. Use caution with the iron so as not to damage components in densely-packed areas.

f) The gray wire is passed between the rear metal frame and PC board to connect with the center terminal on the Hi/Lo power switch, whose function is not affected in the transmit mode.

g) The module is secured (foil side up) by removing the screw in the optical chopper board which is nearest the channel-selector switch, and with the rear side of the module under the lip of the metal frame. The optical chopper board is located above IC3-IC6 in the control head. The notch in the module is positioned over the hole in the chopper board and secured with the screw. The violet wire and the resistor on the optical chopper board should be repositioned to keep from being pinched between the chopper board and the module.

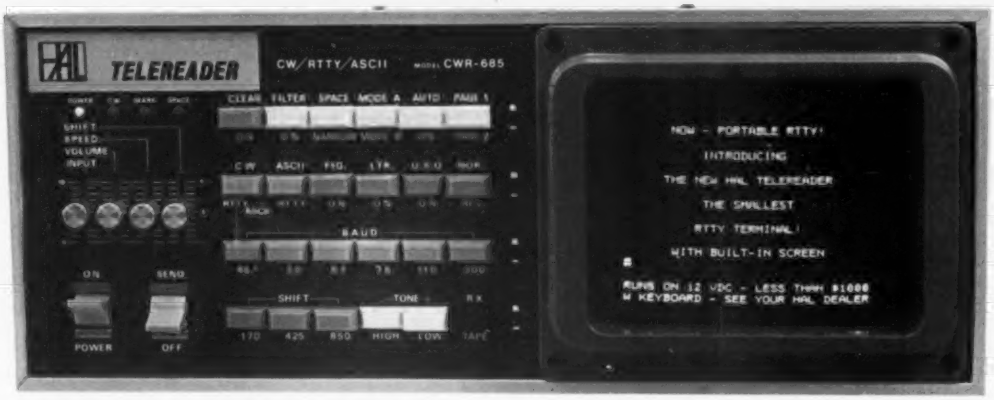
The module is now installed and the control head may be reassembled in reverse order of disassembly. Be sure the meter is properly aligned or the plastic front panel will not fit correctly.

Operation and Checkout

After reassembling the transceiver, hook up power and antenna. A signal generator and dummy load with wattmeter is desirable but not essential. Check out all functions according to the owner's manual. Everything should work normally with the exception of position 3 on the memory-channel switch. If normal operation on all other positions of the switch cannot be obtained, check for wiring errors and/or solder bridges in both the memory-channel switch and connections to the control head's PC board. Two areas to pay particularly close attention to are where the wires from the module are soldered on

RTTY To Go.

Loud and Clear.


HAL
TELEREADER
CW/RTTY/ASCII
MODEL CWR-685
CLEAR
FILTER
SPACE
MODE A
AUTO
PAGE 1
SHIFT
SPEED
VOLUME
INPUT
CW
ASCII
FIG.
LTR.
U.S.O.
NOR.
BAUD
45.5
50
57
75
110
300
ON
SEND
POWER
OFF
SHIFT
TONE
RX
170
425
850
HIGH
LOW
TAPE

NOW - PORTABLE RTTY!
INTRODUCING
THE NEW HAL TELEREADER
THE SMALLEST
RTTY TERMINAL!
WITH BUILT-IN SCREEN

RUNS ON 12 VDC - LESS THAN $1000
W KEYBOARD - SEE YOUR HAL DEALER

The Portable HAL Telereader CWR-685A.

Now RTTY can hit the road with you, when you take along this portable telereader from HAL.

HAL offers the smallest RTTY terminal you can find. It's easy to pack and go — on long drives, camping trips, boating, anywhere away from home.

Pick up your portable HAL Telereader at your favorite amateur dealer store today — you can order it *to go!*

See HAL RTTY equipment at your favorite amateur dealer store.

Write or call us for more information.

- **Baudot, Morse, ASCII**
- **Built-in RTTY Demodulator**
- **High or Low RTTY Tones**
- **Built-in 5" Green CRT**
- **Four-page Display**
- **Compact Size (12¾W x 5H x 11½"D)**
- **With External Keyboard**
- **Runs on 12 VDC**

HAL

HAL Communications Corporation
P.O. Box 365
Urbana, Illinois 61801
(217)367-7373

345

© HAL 1981

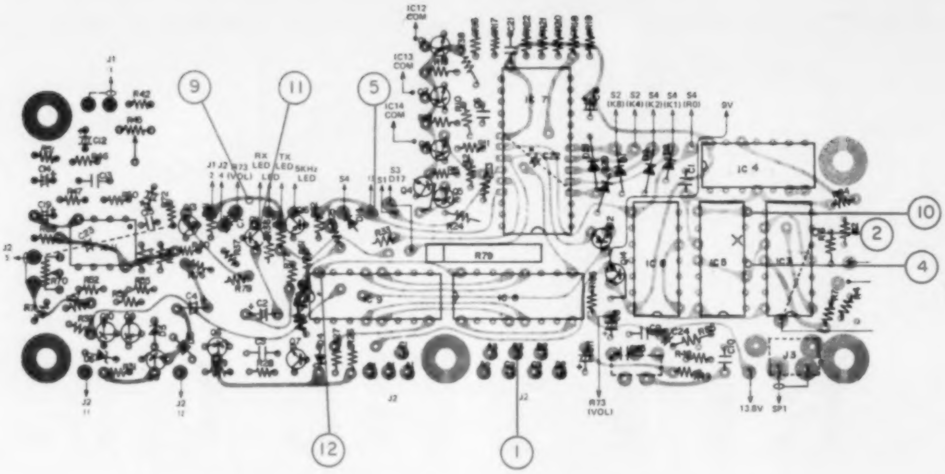


Fig. 6. Microprocessor and control board modifications location.

the leads of the CMOS IC in the head and also the tab on the memory-channel switch which has the yellow wire connected—it may be shorting to the metal frame.

Parts List

C1	.01-uF, 12-volt ceramic disc
C2	.0047-uF, 12-volt ceramic disc
C3	.1-uF, 12-volt ceramic disc
C4	1-uF, 16-volt electrolytic PC mount (aluminum or tantalum)
C5	10-uF, 16-volt electrolytic PC mount (aluminum or tantalum)
D1-D7	1N4148 or equivalent silicon
ICI	4001 CMOS quad, NOR
IC2	4016 CMOS quad, analog switch
IC3	4011 CMOS quad, NAND
R1	1.3M, 1/4-Watt carbon film
R2-R7	47k, 1/4-Watt carbon film
R8	1M, 1/4-Watt carbon film
R9	120k, 1/4-Watt carbon film
R10	22k, 1/4-Watt carbon film

Misc.—PC board, solder

12 ea. 26- or 28-gauge stranded, plastic covered wire in 5" lengths in 12 primary colors and pastels in pink and in light green

1—26- or 28-gauge stranded plastic covered wire 6" in length, yellow

1—26- or 28-gauge stranded plastic covered wire 3" in length, red.

To activate the scanner, select position 3 on the memory-channel switch. Do not be alarmed if nothing happens at first, but after about 10 seconds the digits will start counting down.

If the Hi/Lo power button is OUT, the scanner will pause again after changing from 146.00 MHz to 145.995 MHz whether or not a signal is received. After the pause, it should start counting rapidly downward until reaching 148.11 MHz, where it will count at a much slower rate.

When the Hi/Lo button is OUT and the displayed frequency is below 146.00 MHz and after the initial pause, a squelch break will not stop the scanner.

When the Hi/Lo button is IN, a squelch break (accompanied by the lighting of the Receive LED) should stop the scanner both above and below the 146.00-MHz boundary.

If these conditions cannot be obtained, check the input gate to the monostable on the module and also see if the cathode of D4 goes to ground when the squelch is broken.

If the rig is keyed, the scanner should always stop, thus preventing unwanted interference to others.

If a signal generator is available, hook it up to the antenna connector of the 280 and check to see that the scanner will stop on the right frequency. This check can also be performed using off-the-air signals if their frequency is known. If the scanner stops too late, increase the value of C3 by .001 uF to .005 uF.

Here are some ways the scanner may be used.

If the scanner pauses on a frequency of immediate interest, select position D on the memory-channel switch. This will be the same frequency as in the scanner position. Be sure to select the proper mode of duplex or simplex before transmitting.

If the scanner pauses on a frequency of less immediate interest, select either position 1 or 2 on the memory-channel switch and press the memory button to store the frequency. Select position 3 to resume scanning.

If a signal is received above 146.000 MHz and is not on the 15/30 kHz band plan, the scanner will pause on the 15/30 kHz band plan frequency closest to the signal. The signal normally will be quite readable. However, before transmitting the transceiver-tuning increments should be changed to 5-kHz steps according to the supplemental operator's sheet enclosed with the IC-280 in order to obtain the correct operating frequency.

Summary

With a few hours time and $10 to $25 invested, depending on where the parts are obtained, a reliable and simple-to-operate scanner can be added to the IC-280 without drilling holes or otherwise destroying the front panel. To date, seven scanners have been built using the above data and have been working with no problems.

For those who elect not to make the PC board, an assembled and tested module may be obtained by sending me a check or money order for $25. Etched and drilled PC boards only are available for $15.

Brief technical questions on the scanner can be answered only if you send me an SASE.

I would like to acknowledge the invaluable assistance given me by Allen N7ABM with the instructions on the construction aspects of this article.■

Reader Service for facing page ✓15→

ICOM Presents the
Minicom IC-25A

Imagine..25 watts/5 memories/2 scanner systems in a 2"H x 5½"W x 7"D 2 meter transceiver!

A *very* small package with a 25 watt punch, the IC-25A is a full featured FM transceiver for the space conscientious operator. Nearly the same size as an automotive AM radio, the IC-25A will fit in places usually considered impossible for a one piece 2 meter transceiver. The IC-25A is no lightweight when it comes to features:

- 5 memories. Store your favorite frequencies.
- Priority channel. Monitor your most important frequency.
- 25 watts high/1 watt battery saving low power.
- Touchtone™ mic standard..no extra cost...to work your favorite autopatch repeater.
- Full band scan/programmable scan (set your own limits)/memory scan....all with automatic resume after preset delay or carrier drop.
- 2 VFO's with data transfer standard.
- 2 tuning rates 5KHz (A VFO) or 15 KHz (B VFO).
- Nor/Rev switch for instant monitoring of repeater inputs.
- Memory back up power supply option holds memory when attached.

5½ inches wide
2 inches high
VFO
A B
b.52
S 1 3 5 9 20dB 60dB
FULL-S SIMP NOR
ICOM
WRITE
PROG-S DUP REV
VOL SQL
OFFSET
S/S
OFF
FULL LOW
IC-25A
ICOM
IC-HM8
OFF ON
1 2 3 4 5 6 7 8 9 * 0 #
JAPAN

Actual Size.
(Clip this actual photo out and try it in your car.)

2112-116th Avenue NE, Bellevue, WA 98004
3331 Towerwood Drive, Suite 307, Dallas, TX 75234

ICOM

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations, limiting spurious emissions.

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 8

what to do about it, and lodging official complaints is not the answer. We've been that route for years.

The best solution to a nagging problem like this is to attack. Let's get organized and see what we can do to drive the dreaded dragon off our ham bands. If we work together, we can do it. And, yes, I'm suggesting some deliberate interference. Sauce for the goose.

Despite a lot of science fiction baloney about the woodpecker signals being used for behavior modification, all it is is long-range radar. The only behavior modified is the DX operators who start climbing the walls.

Okay, it's radar. Those of you who have an inkling of how radar works know the answer to the problem already. It's simple. If you want to screw up a radar signal, all you have to do is send a return signal on its frequency which blocks out the echos. Hams, from the earliest woodpecker days, have been driving the monster off their bands by getting on the frequency and sending properly spaced dots back. The screen somewhere in Russia blanks out and the operators utter some Russian oaths and change the frequency to get rid of the interference.

Now, if you chaps would get together into some networks to spot and erase this blight, we could get Ivan off our ham bands for good. You need a keyer which can be adjusted to send back pulses in between the woodpecker ticks.

There are a number of these pests around Russia, so you may have your hands full for a while. With persistence, I think they will stay out of our bands and go elsewhere for their radar work.

Or you can look on the bright side of things as you gnash your teeth over the noise. There is a good deal of evidence that the very high power transmitters being used for this work are having an effect upon the people immediately in its path. Indeed, one of the major woodpecker transmitter sites is just across the border from Finland and the incidence of cancer in the nearby Finnish town is reported to be exceptionally high. At this distance, all we get is apoplexy.

THE DANNALS DEAL

To say that I'm disappointed in a bunch of readers is to understate the case. I've gotten a lot of flack for my strong support of Dannals for the new general manager of the League and I think this needs to be brought out into the open.

Now look here... I think that some loyalty to the president of the League is in order and I don't want any more of those letters telling me that good old Harry is a pompous fathead. Harry and his father before him have been ARRL directors. Could you ask for any more loyalty than that?

And if you're worried about your League getting into trouble, just remember that Harry is already retiring from his lifetime of work as a union steward, so a couple of years as general manager of the League isn't going to make a lot of difference. Isn't it about time that a loyal supporter like that had a chance to get a decent salary for a year or two...and an unlimited expense account? Not to mention a very generous retirement from the League in a few years. That retirement pay plus his first retirement pay should allow Harry to go on as many DXpeditions as he wants without any further worry about money. It's only a few bucks out of your pocket, so why be chintzy?

Remember that amateur radio is in the doldrums right now. It's not the worst doldrums we've had...those were back in 1964-69... but they're pretty dol. Thus it really isn't going to make a big difference what the ARRL does for a while, so why get exercised? I say give Harry his due and stop all the beefing.

It is hard to stop the rumor mill, but I really don't put any credence in the gossip that Harry will be moving HQ to New York so it will be closer to his home. Of course, that would be a bit closer to Washington, where it really should be... but not close enough. Yes, I know that they don't need that huge building any more and that it is a bear as far as heating goes. But remember that the building didn't cost the League much since it was paid for by member building fund donations. With the staff cutbacks, they could make do with a lot smaller HQ building, or perhaps Harry will rent part of the building out to economize.

So let's not hear any more of this heresy and bad-mouthing of Harry, okay? Some of the things he's done have given the impression that he doesn't have both oars in the water, but that may be because you don't have all of the facts. Take heart and remember that even if Harry turns out to be as inept as Baldwin has appeared, the League will still survive. Not to worry.

ARRL ATTACKED

Those few of us who are still reading *HR* were aghast at the February vicious attack against the ARRL in the editorial. What is the world coming to? This would never have happened under the guidance of good old Jim Fisk, who was able to stomach anything the ARRL did.

Ham Radio magazine, which has been dropping steadily in ad support, had some corking good articles in February... too bad if you missed them *and* the ARRL attack. For instance, there was a pip of an article on how to use the HP-34C computer to design Pi-L matching networks, something which I'm sure has plagued all of us. Those pages of charts will be of incalculable value to thousands of hams who prefer to design their own matching networks and put them in place of the factory-built circuits in our sideband rigs.

Another spell-binder was a 7½-page article on the systematic design of crystal ladder filters. I'll bet they thought I'd forgotten all that calculus I was crammed with 40 years ago in college... well, here's where I could finally get it out and use it. You can bet that hams will be quoting that article for several years to come.

With the thermometer outside my window hovering at −10°, I read with amusement their state-of-the-art rotator article... using a rope going through two holes in the house to the beam. The two rope holes would let out enough heat to pay for a rotator in one winter here.

Well, I'm sure we're all glad to see *HR* hanging in there... even after losing both *Ham Horizons* and *Ham Radio Report*.

BUILDING

One of the ways in which radio amateurs have been of value to the country down through the years has been in their designing and building of new equipment. It's been a while since I've polled the *73* readers to see what percentage are into building, but the last poll showed that 80% had built at least one home construction project during the previous year.

The high percentage of ads for parts in *73* indicates that you readers are still building today. I don't think there is any other magazine with more ads for parts. Building is one of the more fun things to do in our hobby, so I'd like to do all I can to encourage more of it.

You know, it doesn't take a lot of technical knowledge to get started building. Once you get into it, you find that you are learning every day. It's a great fun way to learn the technical end of things... learn by doing. Then, when you get on the air, you have something real to talk about. You can beef over the problems you had in getting something to work, knowing that the chap on the other end is eating his heart out that he doesn't have a similar story to swap because he has bought *everything* he is using.

To help get more hams into building, I'm asking that everyone who has designed and built something unique write it up and send in the article. It's your responsibility to encourage more hams to build, and only a wealth of interesting projects will do this. Writing the articles is up to you. I'll publish them.

When I started *73*, it was with the idea of promoting ham building. Down through the years, *73* has always been the builder's magazine. We have used the space *QST* wastes on those endless activity reports to publish articles and more articles, a good percentage of them on small construction projects which can be done in a weekend. Now, with *HR* rapidly fading away, we'll be running a few more of the back-breaking type of construction projects for which they were justly famous. We don't want them to stop just because *HR* is fading away.

Hams are builders. The more construction projects you send in for us to publish, the more you'll get in *73*. I would like to see articles on all aspects...simple projects and engineering masterpieces. I'd like to see 'em on digital circuits, gadgets for the home, for the car, antennas, tuners, automatic identifiers, new slow-scan circuits, color slow scan, and so on. We are perhaps five hundred articles behind on what I would like to see in RTTY developments.

There are some small groups working on ever more exciting repeater networking systems. Let's see articles on these which will spur other groups to get into the game. Let's see articles on the networking circuits. I don't know if you know about it, but there are at least a couple of ham UHF networks which connect virtually all of the western part of the country together. You can use an HT in San Diego and talk to El Paso or up to Oregon, all without interrupting local repeater operations along the way.

No one has figured out how to get from the Rockies east with these nets so far. The short hops in the flatlands have temporarily stopped the spread of these systems. Perhaps we can have some ideas on that...and more construction projects.

You design it, build it, and write about it...and I'll publish it, getting thousands of hams to build your circuits.

GOOD ARRL NEWS!

Just when I begin to get discouraged over the slowness of the League to react to technology and other changes, something interesting comes along. In this case, there is a report in a well-known DX bulletin to the effect that some badly needed changes in DX contest rules have been made.

The piece reports that the ARRL contest advisory committee in a vote of 8 to 3 has decided to modify the operating periods of both the CW and the phone DX contests to allow two additional hours of operation for both the first and second district stations. They noted that during the last few years the East Coast has come very close to losing its dominance in this event and the committee felt that this rule change would ensure that the traditions of the past are preserved. Bravo!

Anyone with comments pro or con should contact *QST* about this. I think we should continue to look to the League to preserve past traditions and look to *73* to preserve traditions yet to come.

FAVORS

Most of us have read some of the reports from the FCC on the trial and conviction of one of their licensing people for selling ham licenses. A lot of hams got furious when they heard about that.

After talking with some of the people who were intimately involved, a rather different story from the official version is told. It appears that there has been a good deal of cover-up of actions by higher FCC people who seem to have started the whole mess.

I've read the official reports and got the impression that this chap Zigler had been selling ham licenses and got caught, and that there were just a few bad hams involved.

This is reported to have gotten started when Prose Walker, who was the chief of the ham division of the FCC, started asking Zigler to do some "favors" for friends of his—upgrading of licenses, special calls. Zigler apparently got fed up with this after a while and told some of his close ham friends about the situation and asked if *they* had any special cases who might need a favor, as long as he was doing favors. No money was involved with any of this. One chap I talked with swears he was in the room with Zigler when Walker called with a request for five more friends of his to get favors.

Things mushroomed, with the final count being 843 favors granted by Zigler. That's more than a few. Eventually the word got around and Zigler's friends began getting cash offers for upgrading of their tickets. Then, after a while, some of the friends were sending Zigler cash. It's tough to send back unaccounted-for cash.

Someone finally blew the whistle. Zigler was convicted and put in prison for a few days. The FCC came out of it fairly clean, and a few of the favor recipients lost their tickets. Just a few, not 843.

This is still grinding along through the courts on some level, so some day we may get the facts and be able to put all this into perspective. The people involved use the term "favors" rather than bribery. This seems more applicable in this case. I understand, too, that Zigler was quite upset by the pressures he was under to do these favors for Walker and I suspect that the favors for friends were more in retaliation for being forced to do what he considered wrong than as an enterprise in itself. All agree that Zigler was one of the nicest guys you could ever want to meet and that he was a victim, not a criminal.

Well, that's the story. I'm open for any further information, pro or con, as this develops.

Some of the victims of this disaster are asking what the real difference is between someone who has been upgraded as a favor and the chap who has spent one day with Bash in his high-pressure memorization course which teaches you all of the test answers word for word. The end result is about the same: a higher grade license with no knowledge necessary.

The real misery comes later when these people get on the air and can't let their fellow amateurs know that they don't know anything. That's when we start finding bad language and disruptive operating.

I can't in any way defend what these chaps claim Walker got started...or Zigler continuing it. But is it fair to crucify Zigler and let Bash keep going?

SMITH CHARTS

That's right, Dick Smith of Dick Smith Electronics in Australia is charting a trip around the world via helicopter. And, yes, of course he'll have a ham rig aboard, working 20-40-80 meters as he flies.

The trip, which is scheduled to start in August, 1982, will be a solo flight, with most hops in the 200-400-mile ranges. It will start from Dallas and run up the east coast, across to Greenland, Iceland, the Faroes, down across Europe, down by Jordan and Egypt, across Saudi Arabia, Pakistan, up to New Delhi and Katmandu, down to Calcutta and Rangoon, and on down Australia to Sydney...home. Then he'll head back up through eastern Asia across the Philippines, Japan, and across the northern Pacific via a couple of shipboard refueling stops to Adak in Alaska, down to Anchorage, Seattle, and to Dallas. He's expecting to end the trip in early 1983...the first solo helicopter flight around the world.

Working him as he is flying will be fun, but I do hope he will plan some time on the ground to get on the air and give us DX fanatics contacts with the 30 countries he will be visiting along the way.

As the trip draws near, we'll

DICK SMITH
'EXPLORER'

Australia's Dick Smith VK2ZIP.

try to have a lot of information on it for you.

READER RESPONSES

There are some questions about *73* on the reader response cards and every so often we get reports from the firm which processes these for us. I think you may find some of the news interesting.

For instance, the latest replies, sampling about 5% of the readers, gives our readers an average income of $26,400 per year. Surprisingly, perhaps, 31% are making over $30,000 per year. Affluent group, really. That's up from 21% a year ago.

We asked how much you spent last year on ham gear and the average was $750. That's the average! When we apply that to the entire readership of *73*, we find that you are spending nearly $8,000,000 per *month* on ham equipment. Now that's just you *73* readers, mind you, not the average ham. Indeed, there is a good reason to believe that our group represents about 70% of the total buying of ham gear. That's higher that we expected.

Manufacturers looking for new products which will interest hams should note that 13.1% of the readers are actually active on RTTY today and 48.9% say they are not on RTTY, but are interested in getting on RTTY. That comes to around 60,000 *73* readers who have expressed an interest in RTTY. That's a gold mine if I ever saw one.

With the increased circulation of recent months, and going by the reported readers per copy of the magazine, over 125,000 hams are reading *73* every month. At $3.00 per copy, there is a lot of pass-along readership, but the pass-alongees are mostly active buying hams, not retired old-timers on pensions.

Speaking of gold mines, 80.5% of the readers want more articles on satellite television. I honestly expected to run into the usual resistance to new ideas with this and am pleased that everyone is hot to trot. You know, it is only a matter of time (and not much) before hams start getting much more into satellite communications. The time is just about here for that.

From 73 MAGAZINE
THE MOST UP-TO-DATE REPEATER ATLAS AVAILABLE!

WORLD
Repeater
ATLAS
Repeater
Repeater
Repeater

INCLUDES:
- *LISTINGS BY STATE AND COUNTRY*
- *LISTINGS BY FREQUENCY*
- *MAPS FOR EACH STATE*
- *28 MHZ THROUGH 1296 MHZ*
- *PERFECT FOR MOBILING*
- **WORLD REPEATER ATLAS—BK7315—Completely updated, over 230 pages of repeater listings are indexed by location and frequency. More than 50 maps pinpoint 2000 repeater locations throughout the USA. Foreign listings include Europe, the Middle East, South America and Africa. $4.95.**

IN STOCK AND READY TO SHIP
*Use the order card on the Reader Service page of this magazine
or itemize your order on a separate piece of paper and mail to:
73 Radio Bookshop • Peterborough NH 03458. Be sure to include
check or detailed credit card information. No C.O.D. orders accepted.
Add $1.50 handling charge for the first book; $1.00 for each additional book.
Questions regarding your order? Please write to Customer Service
at the above address. Please allow 4-6 weeks for delivery.
FOR TOLL FREE ORDERING CALL 1-800-258-5473

WALKMAN TALKMAN

About three years ago, Sony came up with one of their usual brilliant ideas . . . the Walkman. This was a tiny audio cassette player which could be worn on the belt and used with a startlingly new type of lightweight stereo earphone system to make it possible to enjoy truly high-fidelity sound reproduction.

Having been a manufacturer in the hi-fi business back in its early days and thus knowing what is involved in such reproduction, seldom heard with home systems which are affordable, I was astounded when I first heard the Walkman player. It was great for walks and even for skiing. Of course, by the time I loaded up for skiing with the Walkman, some tapes, and an HT, my pockets were so full of expensive electronics that I didn't dare fall down.

As tiny as the first Walkman from Sony was, a couple years later they surpassed themselves with an even smaller player . . . almost the size of the cassettes, only a bit thicker. This came out at about the time that the market was being flooded with knock-offs of the original Walkman made in Hong Kong and Taiwan.

If you have never listened to the sound from a Walkman, you should take the opportunity the next time you see a friend with one.

Okay, now on to the Talkman . . . not by Sony, but being made by an old Japanese friend of two-meter hams . . . Standard. I ran into an ad for this unit in the latest JS&A catalog. Joe Sugarman, who, by the way, is a ham, has built up quite a reputation for state-of-the-art men's toys, so I wasn't surprised to find this new gadget appearing first in his catalog.

The Talkman is a 50-MHz transceiver which you wear on your belt and which comes with a headphone-microphone set. It is designed for use by two people who want to be able to talk despite local noise or moderate separation. The transmitter is voice actuated, so you don't have to flick any switches. The sound is excellent quality, and there are a minimum of controls and adjustments so that anyone can put it on and use it.

This is just what Sherry and I have been looking for to use in the Dodge van. It is so noisy in the van that normal conversation is almost impossible, even when she is in the front seat. As soon as she heads for the seats in the middle or the lounge in the back, we've always had to scream to be heard. The Talkman is perfect for this type of use.

The Talkman is also great for things like skiing lessons where you want to talk to someone without having to yell a hundred yards or so. Or for talking with someone on top of the tower making adjustments while you are in the shack tuning up. The chap on the top of the tower does not need to hold an HT in one hand and the tower with the other. We lose a lot of hams that way.

Have you ever gnashed your teeth in frustration while waiting for your wife to come to an arranged meeting spot in a shopping mall? With a portable typewriter I could have written an encyclopedia just in waiting time. Now, with the Talkman . . . I'm able to find out just which of the toy stores has grabbed her and is holding her for ransom. Grandchildren, you know.

They're a lot lighter and easier to use for short-range communications than HTs, even if both people wanting to talk have tickets. No license required for these low-powered 50-MHz sets . . . and the antenna is built into the headphone wires, so you don't even poke out eyes.

Sherry, who is into ballooning (just went down for her instructor's ticket), will find the sets great for balloon-to-ground communications. It's very handy to let the ground crew know where you're planning to land. Sherry got hooked on balloons when we went down to Florida about five years ago for a two-meter balloon-to-balloon operation. Now she has her own.

I've often wondered why Standard didn't keep up with the US two-meter market. They were one of the first and foremost in the field here, but then got behind when the Icom synthesized rigs came out. I still see some great looking Standard ham gear in the Japanese magazines, but no sign of US models being made. I'm still getting good use from my old Standard HTs.

Take it from Mainerd . . . ™

"You'll have the best matched pair in town!"

Matching your antenna and transmitter requires the accuracy of our 1000-A RF Wattmeter for serious DXing. Trimming your antenna for the frequency you're working ensures you'll get maximum power out and minimum reflected power back. Get more reach with the best matched pair in town.

R.F. WATTMETER

You can depend on Dielectric, **THE MAINE SOURCE**™ for 2-year-warranted RF products — quality meters, couplers and loads.

©1981 Dielectric Communications

Call us for more information and the name of your nearest dealer.

We're a Courage Center HANDI-HAM supporter.

New England integrity and craftsmanship . . . as traditional as Maine Lobster.

17

DIELECTRIC COMMUNICATIONS

A UNIT OF GENERAL SIGNAL

Raymond, Maine 04071 USA / 207-655-4555 / 800-341-9678 / TWX 710-229-6890

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output.
- CROWBAR OVER VOLTAGE on all Models except RS-4A.
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE.
- THREE CONDUCTOR POWER CORD
- ONE YEAR WARRANTY • MADE IN U.S.A.
- VOLT & AMP METER ON MODELS RS-12M, RS-20M & RS-35M
- Separate Volt and Amp meters, with Voltage adjustable from 5 - 15 Volts on VS-20M and VS-35M.
- Built in Speaker on RS-12S and RS-20S

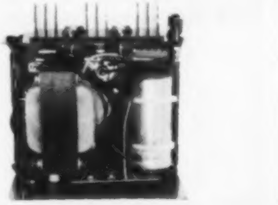
MODEL VS-20M

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE 105-125 VAC
- OUTPUT VOLTAGE 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- REGULATION ± .05 volts no load to full load & low line to high line

MODELS	Continuous Duty (amps)	ICS* (amps)	Size (in.) HXWXD	Shipping Wt. (lbs.)
RS-50A	37	50	6×13¾×9½	45
RS-35A RS-35M VS-35M	25	35	5×11×11	27
RS-20A RS-20M RS-20S VS-20M	16	20	5×9×10½	18
RS-12A RS-12M RS-12S	9	12	4½×8×9	13
RS-10A	7.5	11	4×7½×10¾	11
RS-7A RS-7B	5	7	3¾×6½×9 4×7½×10¾	9
RS-4A	3	4	3¾×6½×9	5

*ICS – Intermittent Communication Service (50% Duty Cycle)



Inside View – RS-12A

ASTRON CORPORATION

2852 Walnut – Unit E
Tustin, CA 92680
(714) 832-7770

358

RINGO RANGER II

7dB GAIN

HIGHEST GAIN 2 METER OMNI

OUTPERFORMS CONE AND DOUBLE ZEPP

WORK MORE STATIONS

ELIMINATE NOISE

LIGHTNING PROTECTED

ACCESS MORE REPEATERS

ASSEMBLE EASILY

INSTALL QUICKLY

A COMPLETE ANTENNA ALL PARTS INCLUDED

600,000 HAPPY USERS BECOME ONE TODAY

ARX-2B 134-164MHz
ARX-220B 220-225MHz
ARX-450B 435-450MHz

TERRIFIC 2 METER RANGERS

MOBILE RANGERS

MORE RANGE

3 dB GAIN

5/8 λ STAINLESS WHIP

GRIP TIGHT 90LB MAGNET

CHROME PLATED BASE

NEAT APPEARANCE

THUMB LOCK ADJUSTMENT

NO WHIP CUTTING

LOW PRICE

MAGNETIC MOUNTS
AMS-147 146-148 MHz
AMS-220 220-225 MHz

TRUNK LIP MOUNTS
ATS-147 146-148 MHz
ATS-220 220-225 MHz

BUY FROM YOUR DEALER

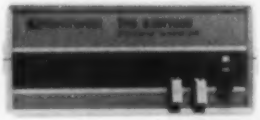
cushcraft
CORPORATION

THE ANTENNA COMPANY

48 Perimeter Road, P.O. Box 4680
Manchester, NH 03108
Telex - 953050

106

THE
INTERFACEtm



THE INTERFACEtm
THE MISSING LINK
Sugg. Price $189.95

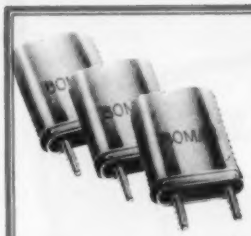
KANTRONICS, the innovator in code readers and RTTY terminals, leads the pack again with **THE INTERFACE.tm**

Your personal computer becomes a complete CW and RTTY terminal with **THE INTERFACEtm** linking it to your transceiver.

THE INTERFACEtm receives any shift of RTTY, ASCII, or CW and transmits all necessary AFSK tones for RTTY, ASCII, and RTTY-CW ID. The manual includes a complete software example for the Apple II Plus, featuring screen display, buffered keyboard, status display, and much more. Software for the Apple and Atari are also available on diskette.

Follow the leader - KANTRONICS - into the computer age of amateur radio. See **THE INTERFACEtm** at your authorized Kantronics dealer or write for a brochure.

Kantronics
(913) 842-7745
1202 E. 23rd Street
Lawrence, Kansas 66044



WE'RE ROLIN IN CRYSTALS! 418

2 Meter Crystals — $3.95 each
(10 or More — $3.50 each)
Quick Delivery

We Stock Crystals For:

Clegg, Drake, Icom
Kenwood, Midland, Regency
Standard, Wilson, Yaesu
Lafayette, Tempo, VHF Eng

(Custom Crystal Orders Accepted.)

Rolin Distributors
P.O. Box 436 Department 7
Dunellen, N.J. 08812
201-469-1219

Precision Cut Land Mobiles Available

Full Color SSTV!

Simulated TV picture

Announcing the K/W SC-422A 3-Memory SSTV Scan Converter System* ... The World's First FULL COLOR SSTV with Motion Animation and Colorflash!

The K/W SC-422A Scan Converter System now makes it possible for you to transmit and receive both FULL COLOR or BLACK and WHITE SSTV with selectable 128 or 256 pixel resolution!

FULL COLOR PICTURES CAN BE DISPLAYED:

- On an RGB Color Monitor
- On a Standard Color TV set with the K/W Color Encoder Model #CE 1101
- Or on a Standard Color TV set using a K/W Interface Board.

Color pictures can be put into the three memories of the K/W SC-422A Scan Converter with a standard black and white TV camera using Red, Green, and Blue filters!

A tunable signal sync control assures painting of off-frequency stations without retuning the VFO.

The dual-speed switching circuit between memories #1 and #2 provides motion animation.

In addition, the "fantastic" KB 422A Keyboard Graphic Generator and LP 422A Light Pens allow you to produce great color graphics.

Now you can add FULL COLOR SSTV to your system at reasonable cost.

For detailed technical and ordering information, contact: Mr. Walter Giesser WB2OWX, R & D Manager, Ext. 207.

*Built in Germany by Volker Wraase Elektronik to K/W Control Systems specifications.

K/W **CONTROL SYSTEMS, INC.**
South Plank Road, Middletown, New York 10940
Phone: (914) 355-6741 TELEX No. 13-7428

122

look here

call toll free:nights
1-800-231-3057
7-10 PM CT, M.W.F.
days 1-713-658-0268

Hygain	TH7DX	349.00
ICOM	IC 3AT/IC 4AT	269.00 ea.
	IC 25A	309.00
	IC 730	699.00
	IC 2AT	239.00
	IC 22U	269.00
KLM	KT34XA	469.00
	KT34A	309.00
Santec	HT 1200	269.00
	ST 144UP	299.00
Telrex	10% Off List on Stock Items	
	HAM4	185.00
	HAMX	265.00
Drake	TR5	995.00
	R7/DR7	1299.00
AEA	Morsematic	169.00
	CK1 Contest	115.00
	MBA-RO Reader	269.00

Order **KWM380**	3095.00
& 2 Free Filters High Serial Numbers, All Mods	
Amphenol Silverplate PL259	1.00 ea.
Antique/rare Tubes	Call
Timex 24 Hour Wallclock	24.95
Robot 800A	749.00
400	675.00
Hal CT2100	699.00
KB2100	159.00
New CWR 685A Telereader	875.00
Cubic 103	1195.00
Bird 43, Slugs	Stock
Drake Theta 7000	995.00
Belden 9405 Heavy Duty Rotor Cable 2#16, 6#18	45¢/ft.
Belden 8214 RG-8 Foam	36¢/ft.
Belden 9258 RG8x Mini-Coax	19¢/ft.
Belden 8267RG 213 Non Contam Jacket	43¢/ft.
Alliance HD73	109.95

10% Off **Curtis, Sherwood, Palomar**
Call Quotes Kenwood TS830S, TS530S, TS130S,
NEW DRAKE TR7A/R7A
We Want Special Orders!

Yaesu Specials	New FT1	2395.00
	FT 707	649.00
	FT101ZD/Mark 3	749.00
	FT208R or 708R	289.00

Used Clean Corner

Collins 75A4	350.00 ea
KWM2/PM2	700.00
CX7A/B with Mods	1000.00
TS820S/CW	600.00
516F2	200.00

MASTERCARD VISA

All prices fob Houston except where indicated. Prices subject to change without notice, all items guaranteed. Some items subject prior sale. Texas residents add 6% tax. Please add sufficient postage, balance collect.

MADISON

Electronics Supply
1508 McKinney
Houston, Texas 77010

✓45

DIRECTION FINDING?

- ★ Doppler Direction Finding
- ★ No Receiver Mods
- ★ Mobile or Fixed
- ★ Kits or Assembled Units
- ★ 135–165 MHz Standard Range

- ★ Circular LED Display
- ★ Optional Digital Display
- ★ Optional Serial Interface
- ★ 12 VDC Operation
- ★ 90 Day Warranty

New Technology (patent pending) converts any VHF FM receiver into an advanced Doppler Direction Finder. Simply plug into receiver's antenna and external speaker jacks. Use any four omnidirectional antennas. See June 1981 issue of **73** for technical description. Kits from $270. Assembled units and antennas also available. Call or write for full details and prices.

DOPPLER SYSTEMS,
5540 E. Charter Oak,
Scottsdale, AZ 85254
(602) 998-1151

✓425

TALK FARTHER

. . . with range-extending products from VoCom

VoCom Power Amplifiers

Drive Level	Output Power	Model Number
150-200 mW	25W	2C025-200 mW
1.5 W	20-25W	2C025-2W
1.5W	45-50W	2C050-2W
1.5W	80-90W	2C100-2/25
2W-5W	>30W	2C025-2W
2W-5W	>50W	2C050-2W
2W-5W	>100W	2C100-2/25
10W	100W	2C100-10/25
25W	100W	2C100-2/25
25W	100W	2C100-10/25

5/8 wave
4"
2C025
1/4 wave
2C050
2C100
VoCom
Power Pocket

25, 50, or 100 Watts Power— Whatever your present output level — from 200 mW hand-held on "battery saver" mode to 25W mobile or base — you can use that to drive a compact, 12V power amp from VoCom for much more talk-out power (see chart). Each model has a front panel switch to let you go "barefoot" for short hauls, plus an L.E.D. indicator to show the mode you're in. Full 10 MHz bandwidth gives you virtually unchanged power across the entire 2-meter band. High efficiency design holds down generated heat, low input VSWR saves battery drain by your radio's final amp. Use the chart to see which VoCom Power Amplifier gives you the power out you'd like from the power that you now have.

Power Pocket™ Mobile Amplifier/Charger — Simply plug in your Icom IC-2A(T) and you have a 25W synthesized mobile rig — take it out again, all charged and ready, when you want hand-held operation. Accepts any IC-2A version. Delivers 25W RF output, 2½W audio with 4" speaker to overcome road noise. Charge pocket accepts all Icom battery packs, has independent charging switch, indicator. Mic preamp makes Power Pocket compatible with any mobile microphone and with Icom speaker/mic.

5/8 HT Gain Antenna boosts reception while giving your hand-held full quieting out of spots you're nearly dead in with a rubber duck; provides excellent improvement. Only 8" telescoped, 47" extended. Better than 1.5:1 VSWR. BNC connector.

Spring-loaded 1/4 wave antenna and 4" stubby duck also available. See your favorite amateur radio dealer.

VoCom ✓90
PRODUCTS CORPORATION
65 East Palatine Road
Prospect Heights, IL 60070
(312) 459-3680

Icom and IC-2A are trademarks of Icom-America Inc. Power Pocket and VoCom are trademarks of VoCom Products Corp. © 1982 by VoCom Products Corp.

Vince Luciani K2VJ
PO Box 682
Cologne NJ 08213

Detect Killer Tornadoes

—use an ordinary TV set

Editor's Note: This article presents a controversial method for detecting tornadoes. *73 Magazine* urges you, the reader, to consider ALL practical methods of storm detection. We endorse no particular procedure but do encourage experimentation with the Weller Method and other promising ideas. We would like to hear from any group or individual who has automated the Weller Method or used it in conjunction with an amateur radio network. For more information, see *Tornado-Wise* by Vince Luciani. Available from Cologne Press, PO Box 682, Cologne NJ 08213. Soft cover, $3.95 plus $1.00 shipping and handling.

Grab the cat, Ma! Head for the cellar! The bloomin' TV set just went bright!

How many readers could apply a Sherlock Holmes analysis to those words and come up with the scenario of a tornado watch? A watch in which a family has been using the "Weller Method" of detecting killer tornadoes using a home TV set—and a funnel has just touched down!

Holmes would have had a problem in deciding whether the tornado detector was the cat or the TV set, although the modern detective would know it was the latter. Yet one day there may well be a study of the effect of tornado electrical radiation on cat's fur, for the subject, tornado electrical radiation, is quite controversial.

If you are among the few who have heard of the Weller Method, you may also be among those who remember what it is and—of much more importance to you, Ma, and the cat—how to use it properly.

Back in 1969, Newton Weller of West Des Moines, Iowa, had a garage packed with over 100 TV sets as he worked on his theory that the electrical radiation from killer tornadoes leaves a "signature" in the air for miles around, a signature that could be detected on an ordinary home TV set.

Technically speaking, the electrical radiation from tornadoes peaks very near to TV Channel 2, and Weller discovered that if you properly adjust your TV set's brightness control, the set could then respond to nothing but the tremendous electrical radiation from killer tornadoes. (A description of the Weller Method is given with this article. It should be read carefully before attempting to make use of the technique.)

When Weller had checked out every TV set marketed at the time (to make sure they would all respond properly as a tornado detector), he announced his discovery to the press via a Des Moines newspaper which printed the story a day before tornadoes struck the area. Weller's timing couldn't have been better, though Iowans claim that the probabilities of springtime tornado strikes are always uncomfortably high.

Iowans had a chance to check out Weller promptly, and some did exactly that. Several later wrote to thank him for his contribution to their welfare, explaining that their TV sets had, indeed, gone bright from tornado electrical radiation. This feature is the thrust of the Weller Method—that the electrical radiation from a killer tornado touching down will overcome a darkened screen and cause it to go as bright as a fluorescent bulb.

Closer to home, however, Weller commented, "My wife had all kinds of complaints about those TV sets in the garage, and if that strike hadn't happened when it did I might have given up on the whole idea."

Fortunately, he did not give up. Not that the weather service seems to care. The National Weather Service (NWS) has never cozied up to the notion of a mere TV set "broadcasting" tornado warnings on its own. Despite reports of successful results everywhere, Weller remains largely unrecognized for his work except in Tornado Alley.

NWS has conducted limited testing on tornado electrical radiation. One test, for example, was on a series of strikes near the National Severe Storms Laboratory at Norman, Oklahoma. Those particular strikes apparently had reflected little electrical radiation—as happens with some—and based on those strikes, the report issued later disputed evidence of significant electrical radiation.

Apparently, several of the nation's leading meteorologists disagreed with the report, as was evidenced in counterpoints (somewhat biting) expressed to the NWS. There is, you see, quite a bit of controversy associated with tornadoes, and we really know very little about what causes them and what sustains them. More than cat's fur has been rubbed the wrong way in the argument over whether killer tornadoes pack significant electrical radiation.

While one side says there isn't any electrical radiation to tornadoes, the other side asks about those reports from people who have actually looked inside a tornado funnel and have lived to tell about it. Such reports have been of constant lightning, brilliantly-luminous clouds, "balls of fire," and rotating bands of deep, blue lights similar to those of an arc welder. And, they add, what about the reports of scorched vegetation along a funnel's path (later seen quite clearly from the air), and of the strong smell of ozone (so characteristic of strong electrical discharges)?

In a pig's eye, some have answered.

Pig's eye or cat's fur—the cat's got no one's tongue in the forever hanging controversy over tornado electrical radiation. The *subject* is quite electrifying, anyway, yet one seldom will read about this feature unless one subscribes to certain stuffy journals and is willing to wade through some weighty statements. Few contemporary writers who are meteorologically founded will broach the subject. Yet, the public has a need to know.

Readers should be able to choose for themselves. Perhaps, in a moment of off-season nonchalance, one may be inclined to stifle a yawn over a discussion of tornadoes, but if you are in the proper geographical area (as evidenced by having middle-range ZIP codes), and if it is getting on toward springtime, you are well advised to properly learn the Weller Method—its good points as well as bad.

And speaking of the bad side, it is, indeed, a fact that not all tornadoes pack the extent of electrical radiation that makes the TV screen go bright, which is why certain sides contend you've got holes in the bottom of your salt shaker if you even think the Weller Method is reliable.

"Of course it won't work with a weak tornado where the electrical energy is too low," says Weller. "But that weak tornado won't usually do much more than lift the roof off a hog shed—and even a straight windstorm will do that. The TV set *does* work on killer tornadoes, and they're the ones that count!"

Weller associate Paul J. Waite (Iowa State climatologist) has this to offer: "Until we have the perfect warning system, we should not neglect any opportunities to provide our populace with the means for self-protection from the ravaging destruction of tornadoes." Amen!

How close are we, these days, to perfection with NWS tornado detectors? Not very. Mostly, the NWS relies upon outdated vacuum-tube-type radars. Vacuum tubes, if you remember, were the gadgets that helped us advance our learning until we really took off with the discovery of transistors and solid-state circuitry. NWS definitely needs to replace those old radars.

Exactly, says the NWS, and they have proposed a $250 million network of modern Doppler-type radars, with a few of which they are currently experimenting. (Doppler, by the way, is a physical principle which involves motion detection; whatever else a tornado's funnel can be characterized as, it is certainly a dynamic picture of nature in motion!) But, a quarter-billion-dollar outlay in today's slash-everything economy? Not very likely.

Even so, Dopplers actually add very little improvement in the accuracy of tornado detection. They offer, instead, a significant increase in lead time once they do spot a for-real tornado. That *is* important. Lead time, as they like to say in Tornado Alley, carries a mite more concern in a tornado watch than does lead time on a rising covey of quail. Quite a mite more. It shouldn't surprise readers, then, to learn that the most effective tornado detector anywhere is the trained human eye. Which is exactly the talent NWS makes good use of via concerned citizens in an organization called "Skywarn." These are the civilian spotters throughout the country who offer their services

THE WELLER METHOD

1. Tune your TV set to Channel 13. Adjust its brightness control to make the screen nearly (though not entirely) dark.
2. Switch to Channel 2. Do not make any further adjustments to the set. The screen should still be nearly dark.
3. Sit and wait. If the screen suddenly flashes on brightly and stays lit, move fast! That's the indication that a killer tornado funnel is down anywhere within 5 to 15 miles of you—perhaps, quite near.

Notes

- Be careful, in Step 1, not to set the brightness control too low, or the set may be so desensitized as to not respond even to the tornado's tremendous electrical radiation. (For simplified understanding, consider tornado electrical radiation as being equivalent to a radio transmitter broadcasting on Channel 2; the analogy is reasonably accurate.)
- Some color sets cannot be made to respond to the brightness control adjustment. Be sure to check your set for this capability.
- If your color set does not turn down with the brightness control, your best bet (always) would be to use a portable black and white TV set for the Weller Method. The added advantage of being battery operated makes it useful when power lines inevitably go down in a tornado strike.
- If you are on a cable TV system, disconnect the cable from in back of the set and connect the built-in antenna.
- A local station on your Channel 2 may, during a tornado warning, cause the darkened screen to switch back and forth a few times from being brightly lit by the tornado to the local TV program. As the tornado approaches, its tremendous radiation will take over and cause the screen to stay bright.
- *Not all tornadoes pack intense electrical radiation.* Continue, therefore, to monitor news broadcasts either on a second TV set or by radio.
- Practice the Weller Method when lightning fills the air. Note how lightning affects your darkened screen, and become familiar with how dark to make the set. You will then be more sure of yourself when the time comes that your screen stays brightly lit.
- Be prepared ahead of time—you and your family—on what to do if the screen goes bright. Know your plan well enough to avoid panic reaction. Know what safety measures to take, and know them well in advance.

WATCH FOR OUR NEW PRODUCTS COMING SOON

HAL 2304 MHz DOWN CONVERTERS (FREQ RANGE 2000/2500 MHz)
2304 MODEL #1 KIT BASIC UNIT W/PREAMP LESS HOUSING & FITTINGS **$49.95**
2304 MODEL #2 KIT (with preamp) **$59.95**
2304 MODEL #3 KIT (with High Gain preamp) **$69.95**

MODELS 2 & 3 WITH COAX FITTINGS IN & OUT AND WITH WEATHER-PROOFED DIE CAST HOUSINGS
FACTORY WIRED & TESTED **$50 additional**

BASIC POWER SUPPLY **$19.95**
POWER SUPPLY KIT FOR ABOVE WITH CASE **$24.95**
FACTORY WIRED & TESTED **$34.95**

ANTENNAS & OTHER ACCESSORIES AVAILABLE SEND FOR MORE INFO

COMPLETE KITS: CONSISTING OF EVERY ESSENTIAL PART NEEDED TO MAKE YOUR COUNTER COMPLETE **HAL-600A** 7-DIGIT COUNTER WITH FREQUENCY RANGE OF ZERO TO 600 MHz FEATURES TWO INPUTS ONE FOR LOW FREQUENCY AND ONE FOR HIGH FREQUENCY AUTOMATIC ZERO SUPPRESSION TIME BASE IS 1 0 SEC OR 1 SEC GATE WITH OPTIONAL 10 SEC GATE AVAILABLE ACCURACY ± 001% UTILIZES 10-MHz CRYSTAL 5 PPM **COMPLETE KIT $129**

HAL-300A 7-DIGIT COUNTER (SIMILAR TO 600A) WITH FREQUENCY RANGE OF 0-300 MHz **COMPLETE KIT $109**

HAL-50A 8-DIGIT COUNTER WITH FREQUENCY RANGE OF ZERO TO 50 MHz OR BETTER AUTOMATIC DECIMAL POINT ZERO SUPPRESSION UPON DEMAND FEATURES TWO INPUTS ONE FOR LOW FREQUENCY INPUT AND ONE ON PANEL FOR USE WITH ANY INTERNALLY MOUNTED HALTRONIX PRE-SCALER FOR WHICH PROVISIONS HAVE ALREADY BEEN MADE 1 0 SEC AND 1 SEC TIME GATES ACCURACY ± 001% UTILIZES 10-MHz CRYSTAL 5 PPM **COMPLETE KIT $109**

FREE: HAL-79 CLOCK KIT PLUS AN INLINE RF PROBE WITH PURCHASE OF ANY FREQUENCY COUNTER

PRE-SCALER KITS

HAL 300 PRE . . . . (Pre-drilled G-10 board and all components) **$14.95**
HAL 300 A/PRE . . . . (Same as above but with preamp) **$24.95**
HAL 600 PRE . . . . (Pre-drilled G-10 board and all components) **$29.95**
HAL 600 A/PRE . . . . . (Same as above but with preamp) **$39.95**

NEW!

HAL-1 GHz PRESCALER, VHF & UHF INPUT & OUTPUT DIVIDES BY 1000 OPERATES ON A SINGLE 5 VOLT SUPPLY
PREBUILT & TESTED $79.95

TOUCH TONE DECODER KIT

HIGHLY STABLE DECODER KIT COMES WITH 2 SIDED PLATED THRU AND SOLDER FLOWED G-10 PC BOARD 7-567 s 2-7402 AND ALL ELECTRONIC COMPONENTS BOARD MEASURES 3-1/2 x 5-1/2 INCHES HAS 12 LINES OUT ONLY **$39.95**

NEW — 16 LINE DELUXE DECODER **$69.95**

DELUXE 12-BUTTON TOUCHTONE ENCODER KIT UTILIZING THE NEW ICM 7206 CHIP PROVIDES BOTH **VISUAL** AND **AUDIO** INDICATIONS' COMES WITH ITS OWN TWO-TONE ANODIZED ALUMINUM CABINET MEASURES ONLY 2-3/4" x 3-3/4" COMPLETE WITH TOUCH-TONE PAD BOARD CRYSTAL CHIP AND ALL NECESSARY COMPONENTS TO FINISH THE KIT **PRICED AT $29.95**

NEW — 16 LINE DELUXE ENCODER **$39.95**

FOR THOSE WHO WISH TO MOUNT THE ENCODER IN A HAND-HELD UNIT THE PC BOARD MEASURES ONLY 9/16" x 1-3/4" THIS PARTIAL KIT WITH PC BOARD CRYSTAL CHIP AND COMPONENTS **PRICED AT $14.95**

ACCUKEYER (KIT) THIS ACCUKEYER IS A REVISED VERSION OF THE VERY POPULAR WB4VVF ACCUKEYER ORIGINALLY DESCRIBED BY JAMES GARRETT IN QST MAGAZINE AND THE 1975 RADIO AMATEUR'S HANDBOOK **$16.95**

ACCUKEYER — MEMORY OPTION KIT PROVIDES A SIMPLE LOW COST METHOD OF ADDING MEMORY CAPABILITY TO THE WB4VVF ACCUKEYER WHILE DESIGNED FOR DIRECT ATTACHMENT TO THE ABOVE ACCUKEYER IT CAN ALSO BE ATTACHED TO ANY STANDARD ACCUKEYER BOARD WITH LITTLE DIFFICULTY **$16.95**

BUY BOTH THE MEMORY AND THE KEYER AND **SAVE** COMBINED PRICE ONLY **$32.00**

PRE-AMPLIFIER

HAL-PA-19 WIDE BAND PRE-AMPLIFIER, 2-200 MHz BANDWIDTH (−3dB POINTS) 19 dB GAIN **FULLY ASSEMBLED AND TESTED $8.95**

NEW!

CLOCK KIT — HAL 79 FOUR-DIGIT SPECIAL — $7.95. OPERATES ON 12-VOLT AC (NOT SUPPLIED) PROVISIONS FOR DC AND ALARM OPERATION

6-DIGIT CLOCK • 12/24 HOUR

COMPLETE KIT CONSISTING OF 2 PC G-10 PRE-DRILLED PC BOARDS 1 CLOCK CHIP 6 FND COMM CATH READOUTS 13 TRANS 3 CAPS 9 RESISTORS 5 DIODES 3 PUSH-BUTTON SWITCHES POWER TRANSFORMER AND INSTRUCTIONS DON'T BE FOOLED BY PARTIAL KITS WHERE YOU HAVE TO BUY EVERYTHING EXTRA **PRICED AT $12.95**

CLOCK CASE AVAILABLE AND WILL FIT ANY ONE OF THE ABOVE CLOCKS REGULAR PRICE $6 50 **BUT ONLY $4.50 WHEN BOUGHT WITH CLOCK.**

SIX-DIGIT ALARM CLOCK KIT FOR HOME CAMPER RV OR FIELD-DAY USE OPERATES ON 12-VOLT AC OR DC AND HAS ITS OWN 60-Hz TIME BASE ON THE BOARD COMPLETE WITH ALL ELECTRONIC COMPONENTS AND TWO-PIECE PRE-DRILLED PC BOARDS BOARD SIZE 4" x 3" COMPLETE WITH SPEAKER AND SWITCHES IF OPERATED ON DC THERE IS NOTHING MORE TO BUY * **PRICED AT $16.95**

*TWELVE-VOLT AC LINE CORD FOR THOSE WHO WISH TO OPERATE THE CLOCK FROM 110-VOLT AC **$2.50**

SHIPPING INFORMATION: ORDERS OVER $25 WILL BE SHIPPED POSTPAID EXCEPT ON ITEMS WHERE ADDITIONAL CHARGES ARE REQUESTED. ON ORDERS LESS THAN $25, PLEASE INCLUDE ADDITIONAL $2.00 FOR HANDLING AND MAILING CHARGES. SEND 20¢ STAMP FOR FREE FLYER.

DISTRIBUTOR FOR
Aluma Tower • AP Products
(We have the new **Hobby-Blox System**)

✓31

master charge
VISA

"HAL"
HAROLD C. NOWLAND
W8ZXH

HAL-TRONIX
P. O. BOX 1101
SOUTHGATE, MICH. 48195
PHONE (313) 285-1782

(often, quite courageously) for your benefit and mine.

People from all walks of life have taken up the public service banner in support of Skywarn, though perhaps no group has done so more completely, more effectively, than that special class of citizens known to us as amateur (ham) radio operators.

In Texas, for example, nearly 2,000 ham radio operators are on call to assist NWS when storm alerts are sounded. Most members take annual courses in tornado spotting, not only to improve their effectiveness but also to learn when to zig rather than zag as they are driving out there in the thick of things, spotting a downed twister as it snakes its deadly way across the plains.

Lone Star members of the hobby proved their worth at Wichita Falls, Texas, in 1979, when a series of killer tornadoes caused a half billion dollars damage. NWS credits the early-warning communications networks of radio amateurs with having saved 1,000 to 2,000 lives there. Such is the dedicated public-service nature of a hobby which includes ditch diggers, executives, and even a US senator!

Through it all, and continuing to survive the test of time (which is an admirable bottom-line characteristic to any theory) is the continuing undercurrent of support for the Weller Method. This is from an informed public, those who like the idea of having a detector for killer tornadoes right there in the house.

Not that the Weller Method works on every funnel that comes puffing and blowing down the field, but when the TV set does go bright . . . *"Grab the cat, Ma! Head for the cellar!"*■

Iowa's Only Icom Dealer

ICOM

G&K Amateur Supply
2920 East 9th St.
Des Moines, Iowa 50316

7:00—5:00 Mon-Fri.
7:00—1:00 Sat.

Leroy WD0CZO

✓101

ANNOUNCING
A new standard of comparison for HIGH PERFORMANCE TRIBANDERS
the all NEW
hy-gain® TH 7DX

BROADBAND WITHOUT COMPROMISE

For years now, whenever hams got together and talked about the performance of any triband antenna, they would invariably compare it to the famous Hy-Gain TH6DXX. Now, there's a new standard of comparison—the NEW Hy-Gain TH7DX. This amazing new tribander, using a dual driven element system, maintains a VSWR of less than 2:1 on all bands, including ALL of ten meters. Hy-Gain didn't compromise on performance to achieve this efficiency either. The TH7DX utilizes a combination of trapped and monoband parasitic elements for more efficient broadband performance. This unique combination produces an *average* front-to-back ratio of 22dB on 20 and 15 meters, and 17dB on 10 meters. The TH7DX, with its great broadband characteristics, is the ideal choice for "all mode" operation.

HIGHEST TRIBAND PERFORMANCE, BUT MANAGEABLE SIZE.

The broadband TH7DX has high performance specifications that meet or exceed the monster antennas that seem to take up most of your real estate and part of your neighbor's. However, with its short 20 ft. (6.1 m) turning radius and 31 ft. (9.4 m) longest element, it's no more imposing than a TH6DXX. It's easy to assemble and weighs only 75 lbs. (34 kg). The wind loading is 240 lbs. (109 kg) at 80 mph (129 kph) with only a 9.4 sq. ft. (0.9 sq. m) wind surface area, so the TH7DX is one of the safest and most manageable high performance tribanders you can buy. And, you don't have to spend a fortune on special towers and rotators either.

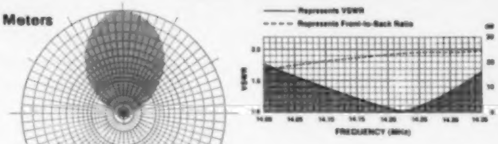
MECHANICALLY SUPERIOR

In a parasitic array such as the TH7DX, high efficiency traps are used rather than parallel stubs. These Hi-Q traps are capable of handling the maximum legal power with a 2:1 safety margin, and are superior to parallel stubbing for ease of assembly and maintenance as well. In fact, quality materials are used throughout this antenna. Includes 18-8 stainless steel hardware for all electrical—and most mechanical—connections plus taper swaged 6063-T832 thick-wall aluminum tubing. The antenna includes Hy-Gain's BN-86 balun and exclusive heavy, die-cast aluminum, rugged boom-to-mast clamp, and heavy-gauge element-to-boom brackets.

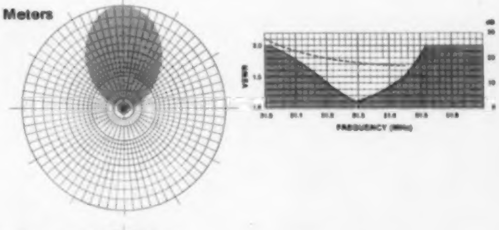
CONVERT YOUR TH6DXX

Hy-Gain hasn't forgotten about the thousands of proud TH6DXX owners. A conversion kit is available which offers all of the broadband advantages of the TH7DX and includes a complete stainless steel hardware package.
It's easy to assemble, and when completed, you have the finest triband antenna on the market, the TH7DX.

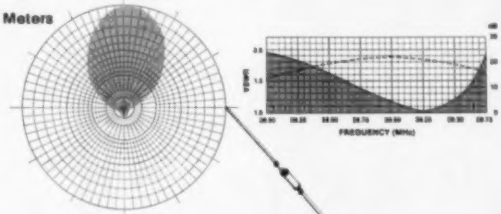
20 Meters



15 Meters



10 Meters



Hy-Gain's BN-86 balun and exclusive Beta Match for dc ground are included. The stainless steel hardware, rugged phasing lines and preformed feed straps permit easy assembly and consistent results.

TELEX® hy-gain®

TELEX COMMUNICATIONS, INC.

9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.
Europe: 22, rue de la Légion-d'Honneur, 93200 St. Denis, France

✓316

Stephen Gibson
PO Box 38386
Hollywood CA 90038

TVRO Dish Selection Tactics

— Satellite Central, part V

Picking the right antenna for your TVRO can be dangerous! Too many people are ready to tell you that theirs is the best. Who can be trusted?

For example, we know the press release blitz touting the 3-foot dish for sparklie-free pictures was just a wild fantasy. All the hoopla was directed at the 12-GHz direct broadcast satellite (DBS), but somehow developed into identical claims for 4 GHz! The mere difference in frequency suggests that this isn't possible at 4 GHz. So you must arm yourself against those that would have you believe that the TVRO antenna department runs on magic!

The antenna wizard and his sacred tools of alchemy.

At the moment, the biggest selling point is gain. But the three things you really should be looking for in a dish are *size, accuracy,* and *feed match.* Despite what sales claims may say, they all carry about equal weight!

Formula Blasts Wild Claims

Here's an easy way to rip away the veil of mystery concerning dish antenna gain versus size. Simply use this formula the next time you see a demonstration or see an ad touting high antenna gain. Just plug in the numbers to find the true gain.

$$\text{Gain in dB} = 10_{\log}(F^2 \times E \times D^2),$$

where F is the frequency in GHz (3.7), E is the efficiency in percent, and D is the diameter in meters. You can convert feet to meters by simply dividing feet by 3.28.

The trick to using the formula is knowing the efficiency of the antenna. While a quality dish may have 55 to 60 percent efficiency, the typical value for home-brew may only be 50 percent owing to poor surface integrity and feed design, as we shall soon see.

As a practical matter, you could stuff the formula into a programmable calculator and take it with you when you go dish shopping. Or you can type the dish gain program seen in Fig. 1 into a pocket computer such as the Sharp or TRS-80. It's only a few lines of code and may very well be worth the effort, especially when a salesman touts his 10-foot dish as having a whopping 43 dB gain! You can simply dig into your pocket and produce a better approximation of the true gain.

I saw an ad in another

```
10 PAUSE "PARABOLIC DISH GAIN" : BEEP 1
20 INPUT "DIAMETER (FEET)"; D
30 INPUT "EFFICIENCY % (55)"; E
40 INPUT "FREQUENCY GHZ (3.7)"; F
50 D = D/3.2808 : G = 10*(LOG(E*(F*F)*(D*D)))
60 PRINT "GAIN = "; G
70 GOTO 10
```

Fig. 1. Calculate true dish antenna gain with this simple program for the Sharp or TRS-80 pocket computer. The program will run on almost any other computer supporting BASIC. What self-respecting computer doesn't nowadays? Only line 10 may need adjustment. The strange values in parentheses in lines 30 and 40 are suggested inputs.

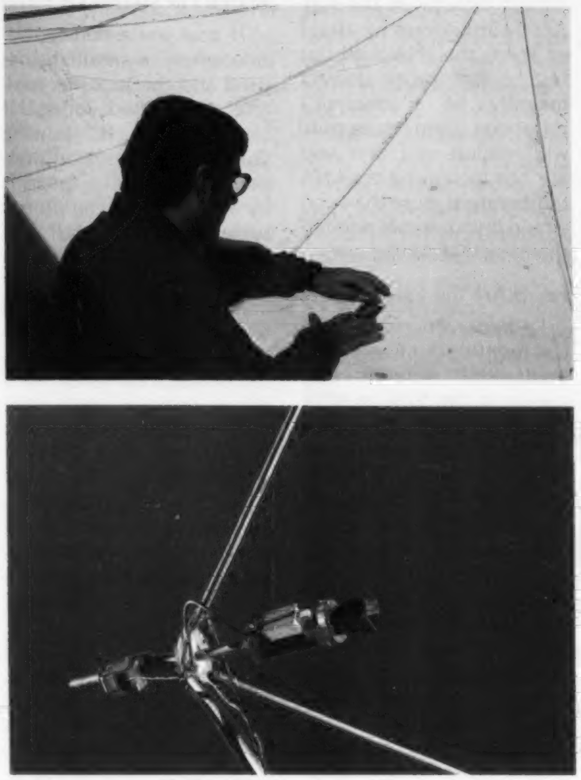


Fig. 2. Doing it with mirrors may tell you the whole story about dish accuracy. Use a small mirror and point the dish at the sun. The reflected rays should bounce into the feedhorn.

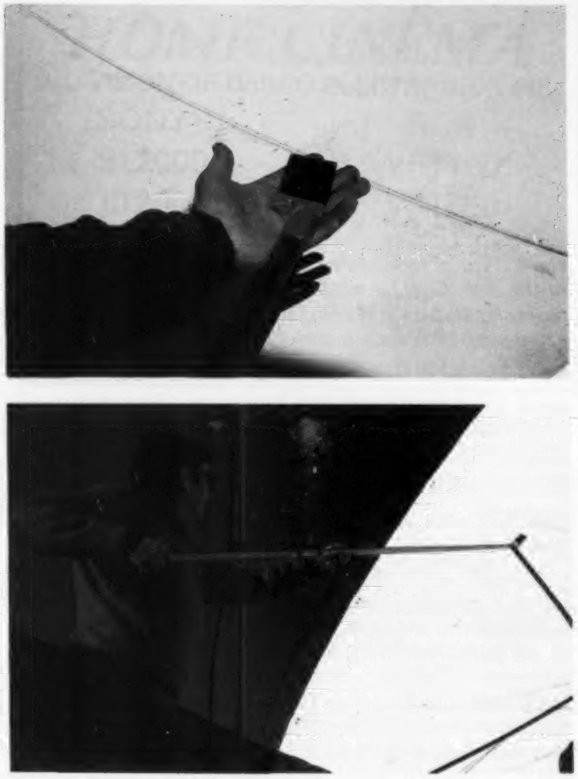


Fig. 3. A long pole or length of wall molding will reach anywhere on a dish and is safer. Tape the mirror to the pole like a hinge so it rests flat on the dish. Very few inexpensive dishes will pass this test. When you find one that does, buy it!

magazine recently that indeed claimed 43-dB gain from a 10-foot dish. This was beyond belief! In fact, I immediately tried to buy one because at 4 GHz, a 10-foot dish would have 100% efficiency and I wanted to be the first to own this eighth wonder of the world! But an excited call to their chief engineer revealed that he not only assumed 100% efficiency, but used a feedhorn known to achieve just 55% efficiency at best for this dish size and depth. He even did all his calculations at the high end of the band, which he was "...told to do by the sales manager."

This is another trick you might want to watch out for. If gain is computed only at the high end of the band (4.2 GHz), you can make the numbers look nearly 1 dB hotter. Try it yourself. It's like adding nearly 2 feet to the dish diameter! This clever ruse can give the buyer or home builder a mistaken impression of the gain being the same at the low end of the band (3.7 GHz), which it isn't! After all, we do want to receive the entire band, don't we? You may think this an arbitrary point, which indeed it might be until you remember that just one single decibel in an FM system like this one can make the difference between a clear picture and a snowstorm. Many manufacturers today are calculating gain this way and you should know about it. *Caveat emptor!*

It's Not How Small You Make It

While it's possible to just get by threshold with only an 8-foot dish using a very low noise amplifier on a hot footprint, you will be better off using a 12-foot or larger dish for really sparklie-free pictures almost anywhere else. Even larger dishes may be necessary as you move off the footprint. Perhaps you recall from our past discussions that the LNA and dish operate on a kind of teeter-totter where a large dish can allow a cheap LNA to be used. Likewise, similar results are possible using a smaller dish and a higher grade LNA.

How small can you go? Eight feet is about the low end for wideband FM video due to the fact that the beamwidth and side-lobe response of smaller dishes let more ambient terrestrial noise reach the feed. Sidelobe response is very important with a TVRO antenna because the signal is about 30 dB or more *below* the noise.

It appears there's more to a TVRO antenna than just collecting a signal. It must also be a kind of rejector as well, a shield to the barrage of interference in the vicinity. It might be easier if the noise were man-made, but the music of the spheres is an annoying din, especially from our own particular sphere, *terra firma*, which demands we use ideas bordering on geometric optics to build workable antennas. As better and smaller antennas are designed, lower noise amplifiers will take up the slack in lost gain due to improved antenna shielding properties. But more work on this problem is needed. The horn/reflector is a very

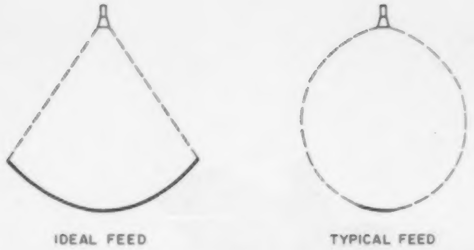


Fig. 4. Typical feedhorns fall off in sensitivity near the edge of the dish. Circular models may capture as much as 1 dB more signal. 1 dB is nothing to sneer at. It's like switching a 120-degree LNA for a more expensive 80-degree model!

good solution despite the plain fact that its large size makes it impractical at the moment.

How To Check Dish Accuracy

A really good dish will follow a parabolic curve to within plus or minus 1/16th of an inch. Achieving this accuracy is no easy feat. Some manufacturers will rightly say that such accuracy won't improve the gain, which is true to some extent. But the argument falls down flatter than a bad dish when side lobes are considered. Side-lobe response is directly related to surface accuracy.

Why are side lobes important? Remember, we are trying to hear a soft conversation in a room full of shouting people. The ambient noise floor at the antenna site may be −130 dBW, but the signal we want is a lowly −160 dBW . . . or worse. Only a narrow beamwidth dish with very low side lobes will receive it while rejecting the noise.

Now in the past, the only way to test a dish was to put it on a test range, feed it signals from a known microwave source, and plot a reception pattern. Then a few clever engineers worked out a method of antenna pattern plotting using noise from the sun. It works rather well but requires some test gear. A less accurate but easy way is to build a mating template that follows the ideal dish curve, place it in the dish, and hope it fits like a glove.

Doing It With Mirrors

But hauling a large template to a dealer or satellite show is not too practical. There must be a better way. And, of course, there always is, but long after you've completed the job, according to Murphy's law. Here's an easy trick I use to spot-check a dish. It's a real trial by fire. Simply place a small mirror anywhere on the reflector surface as seen in Fig. 2. Then point the dish at the sun and look where the reflected rays go. They should bounce right into the feedhorn!

If you imagine, for a moment, the sun as just another satellite, then the sun's rays should always hit the feed or else that particular portion of the dish isn't accurate. Try several spots on the dish. If the sun's rays don't make it, neither will microwaves! Right?

There are a few caveats to doing this test. First, use a small mirror. Less than 3 inches (one wavelength) is necessary. A larger mirror will only make things look worse. Second, crawling on a mounted dish isn't too safe no matter what latitude you're at. So the best method is to tape the mirror to a long pole or piece of wall molding as seen in Fig. 3 and move it around the surface. Third, wear dark glasses. You'll be looking almost directly at the sun. And fourth, don't be afraid of frying the LNA with this test. A flat mirror doesn't magnify. So a moment's reflection (despite the pun) will remind you that you are not increasing the LNA temperature more than you would if you simply pointed the bare LNA at the sun!

Feeds Are the Culprits

Perhaps you recall from last month's discussion that feeds limit antenna efficiency to the 50% to 60% range because their sensitivity pattern cannot adequately cover a dish. See Fig. 4. The ideal feed pattern would be flat as a pancake across the top and drop to zero at the sides. But that's not all. The manufacturer of this fabled horn would need several models, one for each size dish, because any overshoot by the horn would add a considerable amount of terrestrial noise to the signal and breed the dreaded "sparklies" faster than rabbits.

Back now to the real world. A lot of work was done on feedhorns in the '60s, mostly by radio astronomers. Their ideal feed overshoot occurs when the edges of the dish are illuminated at a level which is −15 to −20 dB down from the center. As a practical matter, TVRO designers use the −10-dB point on the curve. At the moment, several manufacturers offer nearly identical feeds that cover a narrow range of dish sizes and F/D ratios. Depending on dish size, a typical horn will operate over an F/D range of .3 to .5 with moderate efficiency. F/D is simply dish focal length divided by the diameter. Some companies will design a feedhorn for your specific dish. All that varies is the flare angle of the horn, which directly affects the angle of the illumination pattern.

Watch For Sleight Of Hand

If you see a demonstration where a small dish is used and the pictures look fine, stop and ask yourself if the salesman is showing you only the best transponders. Test your suspicions by asking if you can do the tuning. Then try all the transponders. RCA birds (Satcom) have 24 transponders, while Western Union birds (Westar) have only 12. Not all transponders lay the same footprint levels in a given area, so you must test. In many cases, you may find the test being conducted on a bird which may have a hot footprint in your area. Ask to see what all the transponders look like on other birds. It may be wise to have a log of what is available. A complete list of program sources and times on all the satellites is available from *Satellite TV Week*, PO Box 308, Fortuna CA 95540, (707)-725-2476. Cost is $48/year or $65/year, first class.

You may discover when you have free reins on the tuning knob that many transponders are buried in the sparklies. Throw the salesman off guard by asking why! The answers you get may cause you to reconsider a purchase. Be prepared for the interference argument. It may be valid. Quite often you may discover that satellite TV in your area will be plagued with interference from Ma Bell. At this point, you must be on special guard because location of the dish becomes very important. While your house can make a dandy shield to a direct signal, you must also narrow your search to a very high integrity dish so the side-lobe levels are at their lowest. This problem may cause you to re-think your location. A large rf fence is an eyesore even to the most understanding wife.

Of course you can stifle the interference to some degree with notch filters in the receiver i-f. As a rule, Ma Bell carriers are located plus and minus 10 MHz from the center of a typical transponder. If you install notch filters at 60 and 80 MHz in a typical 70-MHz i-f amplifier, the interference will be drastically reduced and may turn an otherwise unwatchable picture into something that can be viewed, though not fully appreciated as studio quality, mainly because notch filters remove some of the signal you want to receive!

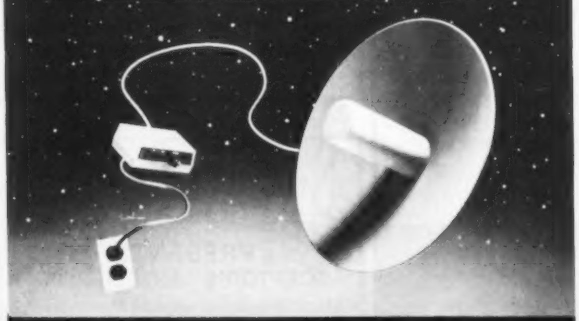
Magic Without Mirrors

Antennas for TVROs are no more different than for any other service when it comes to the rock-solid basics. But you must be on the lookout for magical claims because this field is new to the entrepreneur types who sell only the sizzle. There is a tendency among many (including myself) to buy a product because the advertising is slick or the numbers in the ad fit your calculations and pocketbook.

The problem is "newness." If you see everyone getting fantastic pictures with an Acme Whizbang Launcher, then it must be pretty good. But very few people even know what a TVRO is, let alone a Whizbang whatever. So it's up to you to break the new ground, to make the mistakes . . . and claim the victories. Just be careful and remember that a wise man always looks before he leaps.

The time is right for you to join in the fun of receiving TV from space. If you have a question regarding the topics we cover here, feel free to drop me a line (letters only, no calls please). Sorry, I can only answer mail that is accompanied by an SASE.■

SATURN V
STATE-OF-THE-ART



Quantity discount price structures available upon request for dealers. Dealerships, both domestic and foreign available in many areas. For further information, please contact John Michaels, Sales Manager. Telephone hours: Monday thru Thursday, 10-4.

hi·gain
ELECTRONICS ✔72
4558 Auburn Blvd., Sacramento, CA 95841
(916) 452-0193

HOME CINEMA
A DIVISION OF DEBCO ELECTRONICS INC.

SONY
SL2000
TT2000
SL5000
SL5800
HVC2200

CALL FOR OUR BEST PRICE

RCA
VFT190
VFT650
VFP170
CC010
CC011

All items in stock now!

Converter
Convert your cable VHF Channels to UHF Channels......$34.95

Blank Tape Sale
Zenith L500......................$10.95 ea.
Zenith L750......................11.95 ea.
Fuji T120......................14.50 ea.
(Min. order six)

RG6......................12¢ per foot

RG59......................10¢ per foot

UHF/VHF Baluns
300 Ohm—75 Ohm
Indoor..........$1.00 ea. 10/$10.00
Outdoor.........$2.00 ea. 10/$18.00

Video Stabilizer
Eliminates copyguard
$59.95

AMARAY VIDEO BANKS
Protect your videocassettes
VHS—$1.49—BETA

BIB CLEANING CASSETTE
VHS or BETA
$24.95

UHF Tuners $34.95
MITSUMI UES—A55F
Sanyo 115B

TOROIDAL CORES
75¢ ea.
T25-12 T37-2
T30-12 T44-2

Video Control Center
—No need to change cable to access input to TV
—3 outputs to 4 inputs
—No AC required
$79.95

7808......................$1.25 ea., 10/10.00
7815......................1.25 ea., 10/10.00
7818......................1.25 ea., 10/10.00
LM1458...................... .75 ea., 10/6.00
TL082...................... 1.50 ea., 10/12.00
MC1330......................3.50 ea., 10/33.00
MC1349......................3.00 ea., 10/27.00
MC1350......................3.00 ea., 10/27.00
MC1358......................3.50 ea., 10/33.00

SPECIALTY ITEMS
AB-2 (Deluxe) 2 way AB 75Ω in/out switch) $9.95
AB-75 (Economy 2 way AB 75Ω in/out switch) $5.95
AB-300 (Economy 2 way AB 300Ω in/75Ω out switch)..........$5.95

F-56 (F connector for RG6)
Twist On......................69¢ ea. 3/2.00
Crimp On......................3/1.00
F-59 (F Connector for RG59)
Twist On...................... .69¢ ea. 3/2.00
Crimp On......................3/1.00
F-61 (F type Female)........69¢ ea. 3/2.00
F-81 (Cable Splice)..........69¢ ea. 3/2.00
RCA Jacks......................39¢ ea. 3/1.00

Terms: All orders add 5% Shipping, Handling & Insurance. Minimum shipping $2.50 COD orders add $2.00 (cash only). All orders shipped UPS unless otherwise specified.
Visa/Mastercard welcome! Phone hours: 11 am—7 pm EST.

Debco Electronics/Home Cinema
P.O. Box 9242 Dept. V
Cincinnati, Ohio 45209
(513) 531-4499 or 531-8866
✔110
DE

Star View Systems

H&R COMMUNICATIONS, INC.
Route 3, Box 103G - Pocahontas, Arkansas 72455

86

Introduces the

MODEL 12K SYSTEM . . .

A complete satellite receiving system that you can assemble yourself as a week-end project.

Why spend $7,000 to $10,000. Why pay someone else to install it. Do it yourself in a week-end and save.

ONLY $2,400.00

UPS SHIPPABLE

50 Channels

KIT CONTAINS

- 12' Antenna
- AZ/EL Mount
- 24 Channel Receiver
- 120° LNA
- Feed Horn

- All Miscellaneous Cable and Connectors Needed
- Everything You Need
- No Special Tools Needed
- Complete Antenna Weight Only 125 Pounds

See Your Local Star View Dealer or Call

800-643-0102 or 501-647-2291

Dealer Inquiries Invited

SATELLITE TVRO

RECEIVER COOKBOOK

- Build a good, solid understanding of satellite receiver technology.
- Step by step guide of each stage.
- Complete theory, schematics, and construction details.

TVRO RECEIVER KIT

- Pre-assembled, tested RF section.
- No complex alignment or special test gear required.
- Ultra-low cost/high performance.
- Designed from cookbook circuits.

• • •

$9.95 .... Cookbook
$159.95 .... Cookbook plus Kit

Send to:

NORTH COAST MICROWAVE
PO Box 5663, Cleve., Ohio 44101

107

Enjoy Satellite TV Now

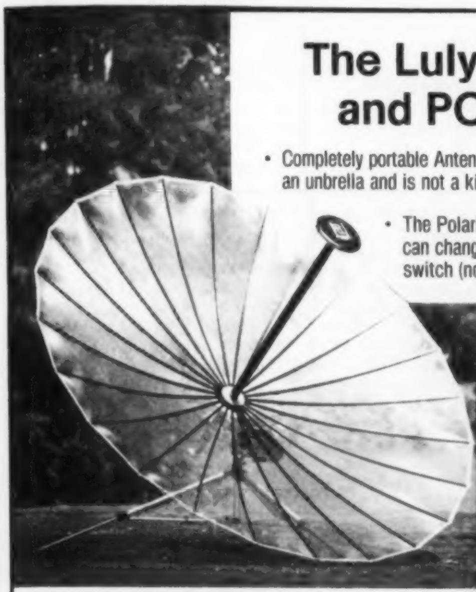
Better than Cable TV—Over 200 TV and radio services. Why waste money? Learn the whole story and build a video system the family can enjoy. No commercials. **FREE** movies, sports and Vegas shows—worldwide, crystal clear reception connects to any TV set. Big (8 × 11 in.) book loaded with details, photos, plans, kits—**TELLS EVERYTHING! Satisfaction Guaranteed.**

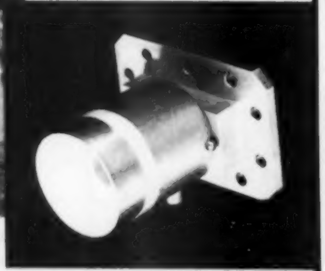
Send $7.95 TODAY! Add $2.00 for 1st class (air mail) or call our 24 hour C.O.D. rush order line **(305) 862-5068.**

GLOBAL ELECTRONICS,
P.O. Box 219-H, Maitland, Florida 32751

The Luly ANTENNA and POLARIZER

- Completely portable Antenna, comes fully assembled (folds like an unbrella and is not a kit).
- The Polarizer is an electronic rotator, which can change polarities with a flick of a switch (no moving parts). Eliminates weight, twisting cables, freeze ups, and down time.





For More Information Write To:

53

LULY TELECOMMUNICATIONS CORP.
P.O. Box 2311, San Bernardino, California 92406
(714) 888-7525
Dealer and Distributor Inquiries Welcome

SCEPTOR COMMUNICATIONS, INC.

PRESENTS
SCEPTOR'S MODEL 300

Satellite receiver with downconverter and new **SAT-TRAC** meter circuit

•Fully tunable	•Tune—scan
•Inverted video	•Tunable audio
•Power supplies	•Remote control

Complete Systems Available!
DEALERS and DISTRIBUTORS NEEDED!

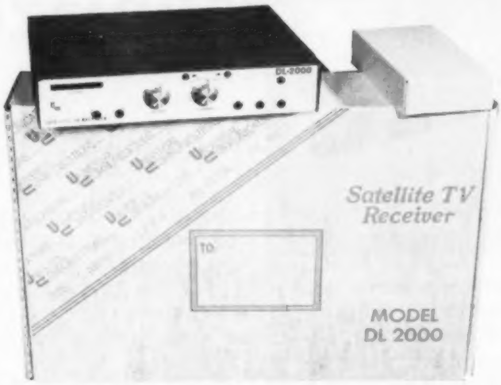
P.O. Box 425
808 1st Avenue
Rock Rapids, Iowa 51246 (712) 472-2213

111

Universal Communications
A DIVISION OF INNOVATIVE LABS, INC.
P.O. BOX 339
ARLINGTON, TEXAS 76004-0339

UC

Introducing The Universal Communications Satellite Receiver Model DL-2000



FEATURES:

- * Built-in Modulator
- * Built-in Scan (aids in Satellite Tracing)
- * Lower, Inband Oscillator Leakage (−30dbm Typ)
- * True-Wide Band Threshold Extension
- * Built in Metering
- * Video Polarity Shift
- * Excellent AFC Performance
- * True Picture Quality
- * Variable Sound Tuning
- * Active Clamping Circuit—True Clamp (not diode clamped)

- * External Video
- * External Audio
- * External Meter Jack
- * LED Bar Signal Meter
- * AFC Indicator
- * Switchable LNA Power Down Coax
- * Quality Construction
- * Features Add-on Remote Control—Only $38.50 (Optional)
- * LED Tuning Indicator
- * Audio & Video Outputs
- * Converter Tested at −50F Outside Temperature

TERMS: COD, Money Order, Bank Cards
HOURS: 8:30-4:30 CDST; MON-FRI (817) 860-1641

Our product may be copied, but the performance is never equalled.

UNIVERSAL COMMUNICATIONS

P.O. BOX 339, ARLINGTON, TX 76004-0339

Taylor Howard: TVRO Trailblazer

Tim Daniel N8RK
73 Magazine Staff

Taylor Howard W6HD has been called many different names. He didn't mind when the Australian government nicknamed him the "Crazy Professor," but when opponents of the home-TVRO industry labeled Howard as a "pirate," he got mad. "There are pirates out there," Tay Howard freely admits, "but why should I be prohibited from receiving signals that I can't get any other way?"

For Dr. Taylor Howard, the future of satellite TV is a very serious business. Ever since he built the world's first private Earth station, W6HD has been in the forefront of the battle to legitimize the infant home-satellite-TV industry. The debate centers on the availability of services. Howard just wants access to the same entertainment and information that cable TV customers can get.

"I don't want to be a second-class citizen just because I don't live in a condo in New York" is his argument. Without missing a beat he goes on to acknowledge the need for Earth-station owners to pay a fair price for these services.

Tay Howard brings a unique viewpoint to the upstart TVRO field. His heart really lies in the workshop or laboratory, not in a congressional hearing room or courthouse. Howard, along with another ham, Robert Coleman, built the first satellite receivers that the average hobbyist could duplicate. The original Coleman-Howard design is at the root of most of the commercial receivers sold today. Other W6HD innovations include specialized TVRO test gear and a low-cost method of changing the polarity of a feed.

Today, Dr. Howard devotes most of his time to serving the TVRO industry as a spokesman and consultant, but he remains on the faculty at Stanford University where he contributes to NASA's deep-space exploration program. A major chunk of his time has been spent as member and the first President of SPACE (Society for Private and Commercial Earth Terminals), which represents the terminal owners and manufacturers.

The nickname "Crazy Professor" was given to W6HD when he proposed a satellite reception scheme for Australia's outback. Government officials said it couldn't be done—that the signals just weren't strong enough. Howard chose to ignore the doomsayers. After building a big spherical antenna, he attached a receiver and then sat back to watch TV. The aborigines, the government, and even some of Howard's backers were amazed. There wasn't any magic involved; Howard knew that the theory permitted success, but only if someone took the time to try.

SATELLITE TELEVISION SYSTEMS

WE WILL NOT BE UNDERSOLD!!
Complete Systems, Antennas, Receivers, LNA's & Accessories
CALL US TODAY! ✓320
812-238-1456

hoosier electronics

"Nation's Largest Total Communications Distributor"
P.O. BOX 3300 • TERRE HAUTE, INDIANA 47803

In his quiet, yet confident manner, Taylor Howard offered the following thoughts:

- 12-GHz Direct Broadcast Satellites: Aren't the 4-GHz satellites already direct broadcast? Technically, 12 GHz is not that far away. The problems are legal. Even the Europeans are having trouble. There is no way to limit the pattern of a satellite's signal to a country's geographical borders. The threat of cultural imperialism must be solved before the world is ready.
- Impact of Video: Satellite TV can have a positive effect on people's lives. It brings them into the mainstream of life regardless of where they live. Modern kids are pretty good about television. They know the difference between good and bad.
- Microwave Technology: Signal processing has been the downfall of the microwave industry. We need to learn how to integrate the entire system into one package. This would help reduce the expense for uplinking to satellites.
- Opportunities: Hams are a natural for getting involved in the satellite-TV field. We are totally short of competent people. There could be employment for every ham in the country. You need both digital and rf knowledge and the ability to combine the two. An understanding of transmission-line theory is important.
- Appliance Operators: There are lots of hams who are yakkers; you might say that they have a PhD in CB. But that is okay; we need people like that. I've always been technically inclined and will protect the individual experimenter.

AHEIM
ott Hotel

Taylor Howard W6HD.

You won't find Tay Howard with a patch over his eye, stalking the deck of a galleon. Look for him in the Australian wilderness, a college laboratory, or in his dish-filled backyard. He won't be searching for buried treasure. Instead, he may be gazing skyward. Taylor Howard is a pioneer, not a pirate, and for him, satellite television is going to be "big, very big; we haven't seen anything yet!" ■

NEW FOR 82

- **3 Meter (Cassagrain) Feed**
- **24 Petals (Aluminum)**
- **Offset Polar Mount**
- **Chapparral Super Feed**
- **One Man Installation possible**
- **Maximum Gain**
- **350 Lbs. Shipping Weight**
- **Hastings Model 10C**

Sug. Retail: $1595⁰⁰

ALSO FROM HASTINGS

- **Chaparral Feeds**
- **Automation Techniques Receivers**
- **Gillaspie & Associates Receivers**
- **Avantek - Cal. Ampl. LNAS**
- **Systems**
- **Petals Only, Both 10 Ft. and 12 Ft., For the Hobby Minded**
- **Power Drives For 10 Ft. and 12 Ft. Hastings Antennas**

HASTINGS ANTENNA CO.
847 W 1st
Hastings, Nebr. 68901
402-463-3598

✓18

TVRO Q & A

—advice from WB0POP—part II

Ken Rae WB0POP
737 South Clarkson
Denver CO 80209

I found a great deal for a surplus antenna. The only problem is that it's bent. Can it be straightened?

Dents in a metal dish usually can be pushed out with a piece of wood. If the dish is warped from rim to rim, the antenna is probably hopeless unless you remold the entire surface. If the cure is not simple, then start looking for another antenna.

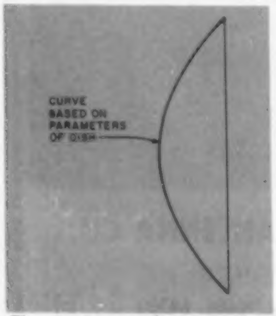


Fig. 1. A wooden template can be used to check the accuracy of an antenna surface.

How can I measure the accuracy of a dish?

The first step is to find the focal point and diameter. Next, using the appropriate equation, draw an accurate representation of the parabolic curve on a large piece of paper. This paper model can be used to make a wooden template that can be lined up against the dish to check its accuracy—see Fig. 1. (The most useful type of template has two of these "half moons," mounted at right angles.) You can check the rim by laying the dish face down, on a flat surface like a level concrete floor. A quick field test can be made by stretching two strings across the dish at right angles (see Fig. 2). A deflection or gap between the two strings indicates that part of the rim is bent or warped. If the rim is true, the two strings should just touch in the middle.

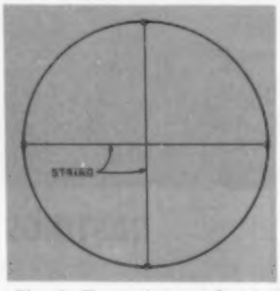


Fig. 2. Two pieces of string stretched at right angles should just touch the middle if the rim of the dish is true.

A friend of mine is thinking about buying an oval-shaped dish. The price is right, but will it work?

Unfortunately, an oval-shaped antenna would be next to useless, no matter what the price. The bore sight of an oval dish is not circular, so you will receive a mixture of horizontally- and vertically-polarized signals. This is unacceptable for conventional TVRO work.

What are my chances of finding an appropriate surplus dish?

You might be better off searching for a bikini-clad beachcomber in Denver during the dead of winter. The tremendous interest in TVRO has made surplus antennas a scarce commodity. There are a few hiding in corners of junk yards waiting to be scrapped. Others are being retired from commercial service. In any case, you'll have to do a lot of looking and have the right contacts.

I can't find a surplus antenna, nor can I afford to buy a new dish. What is my next option?

You can build your own antenna. The spherical de-

MICROWAVE TELEVISION SUBSCRIPTION TELEVISION

****

MICROWAVE TELEVISION EDUCATION MANUAL $16.25

Our updated manual includes microwave concepts, antennas, and downconverters. Includes detailed schematics and P.C. board layouts.

SUBSCRIPTION TELEVISION EDUCATION MANUAL $14.95

Two scrambling & decoding systems are explored in depth. Signal capture and modification techniques are presented for educational analysis.

AMATEUR MICROWAVE RECEIVER SYSTEM $169.95

Continuing in the high quality and performance that you've come to know in the HMRII, this receiver has a new design and increased gain.

INFORMATION PACKAGE ON ALL VIDEO PRODUCTS AND KITS $2.00

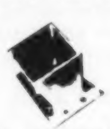
ORDER INFORMATION:

Please add 5% shipping and handling. CA residents add 6% or 6.5% sales tax. **VISA** and **MASTERCARD** accepted.

ABEX
P.O. Box 26601-G
San Francisco, CA 94126-6601
114

****

SATELLITE TELEVISION FEED HORN



MADE FROM .050" BRASS

Used with a PARABOLIC DISH having a focal length to diameter ratio (f/D) .3 to .45

Frequency range 3.30 GHz to 4.90 GHz

Fits a standard CPR 229 flange on the LNA

Introductory offer: $30.00 Postpaid USA

Mastercard - Money order - Cashier Check

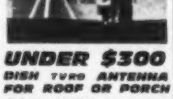
For an additional charge we will adapt this feed horn to your LNA.

FRIEDSAM TV HARDWARE
P.O. BOX 311
112 WEST MAIN STREET
MARSHALLVILLE, GEORGIA 31057
912-967-2828
116

LIVE VIA SATELLITE

$399 COMPLETE RECEIVING SYSTEM

- ***DISH ANTENNA*** MOD #2125
- ***PREAMPLIFIER*** MOD #1202
- ***RECEIVER*** MOD #1601 [illegible]



UNDER $300
DISH TVRO ANTENNA FOR ROOF OR PORCH

JUST PUBLISHED: 8½ X 11 BOOK gives a wealth of updated information on • Antennas • Receivers • Low Noise Amplifiers • Sources • Services • Equipment • Manufacturers • Much More.

Our book takes the mystery out of the sophisticated technology of satellite transmission and reception. This volume represents all the essential knowledge **made easy to understand**, and will show you how easy it is to have a 90 channel reception system so that you can enjoy: first run movies, foreign films, Las Vegas entertainment, live sports, and much more. Everything being telecast in the world could be yours at a twist of a knob!

LIVE VIA SATELLITE, INC.
P.O. Box 2561, Dept. A-4, Delray Beach, FL 33444
Send $9.95 plus $2.50 shipping & handling
or call our 24 hr. C.O.D. order line (305) 845-4447

Name ______________________________

Address ____________________________

APPLIED INVENTION

THE **SOURCE** FOR SOLID STATE / STATE-OF-THE-ART

GaAs FETS by MITSUBISHI

VHF through 18 GHz

NEW **MGF-1200**-$13.00 (0.25dB NF at 144 MHz!)
PRICES **MGF-1400 (2SK273)**-$19.25
EFF. 1/1/82 **MGF-1402 (2SK274)**-$34.00
1412 (2SK275) TESTED and **GUARANTEED** NF at 4 GHz
0.8dB-$85.50 0.9dB-$56.75 1.0dB-$45.50
1403 (2SK276) (fmax=90GHz - Super Low Noise amp.)
$97.00 - $161.75 NF sorted - call for data
1801 (2SK279) (150mW linear PO at 10GHz)-$54.25

Microwave Modules

MITSUBISHI X BAND Hybrid Integrated Circuits with Dielectric Resonator (0.12MHz/°C) GaAs FET Oscillators

FO-1010X - 10.4 GHz, 15mw out, UER100 Flange	$37.75
FO-1210Y - 11.5 or 12.0 GHz, UER120 Flange	$37.75
FO-UP11KF Heterodyne receiver, 10.468 GHz LO Shottky mixer, high or low injection	$34.25

All modules tuneable ±150 MHz, oscillators can be optically FM'd with IR (suggest LD271 below)

X-Band Horn antenna (15dB UER100 WR190 Flange) $16.00

PLESSEY 24GHz Gunn diode modules - call or write

Components

VITRAMON 7800 Microwave Rated caps for bypass coupling
7800P7G08 1.1-1.7GHz 7800P7G04 1.3 - 2.6GHz
7800P7G01 2.6 - 4.2GHz 5 for $5.00

VOLTRONICS ultra miniature microwave variable caps
CP2 - 0.1 to 2.5pf CP10 - 0.5 to 9.0pf $3.19 ea

SOLDER-IN DISK CAPACITORS for VHF-UHF bypassing
RMC JF series 100, 220, 470, 680pf 10 for $2.50

OPTOELECTRONICS from **MITSUBISHI** and **SIEMENS**
MITSUBISHI LASER DIODES 3mW at 830 nm CW
ML3001, 30mA threshold, built in monitor $200 ea
SIEMENS: LD271 high efficiency IR LED, 15 mW $0.75
BPW-34 fast, large area PIN detector $3.00

THERMOELECTRIC HEAT PUMPS for temperature control
MELCOR FRIGICHIPS $21 - $38 Call for data

MINIMUM ORDER $5.00
ADD POSTAGE & HANDLING
$3.50 on Modules (UPS) $2.50 on other items
N.Y. STATE RESIDENTS ADD 6% SALES TAX
SEND S.A.S.E. FOR CATALOG

R.D.2 ROUTE 21 HILLSDALE, NY 12529
518-325-3911
71

SATELLITE TV SYSTEMS

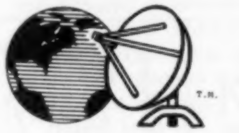
MECHANICAL

AND

ELECTRICAL

ACCESSORIES

Complete Systems, Antennas, Receivers, LNA's & Accessories
CALL US TODAY!



CALL, OR WRITE FOR OUR LATEST BROCHURE AND PRICES.

901-795-4504
109

TENNESSEE ELECTRONICS
P.O. BOX 181108
MEMPHIS, TENNESSEE 38118

2300 MHz MICROWAVE DOWNCONVERTERS

DOWNCONVERTER

Kit	$28.50
Assembled	$48.50

2300 MHz PREAMP

Kit	$25.00

POWER SUPPLY

Assembled	$35.00

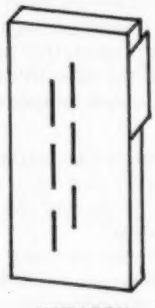
SATELLITE TV EARTH STATION

- 24 Channel Receiver
- 10' Antenna
- Dexcel 120° LNA

Call for details and price

Also Available: Commercial System with Bogner Antenna $169.00

2300 MHz ANTENNA



WITH BOX FOR DOWN-CONVERTER
$27.50

PB RADIO SERVICE

1950 E. PARK ROW • ARLINGTON, TX 76010
404

CALL ORDER DEPT. TOLL FREE
(800) 433-5169

FOR INFORMATION CALL
(817) 460-7071

sign is probably a little bit cheaper and easier to duplicate than a parabolic, but it is also less versatile. If you are good at scrounging materials, you can build either a parabolic or spherical antenna for $100 to $400. However, don't underestimate the amount of work involved.

What about building a stressed dish?

Amateurs have been experimenting with this type of parabolic antenna for many years. Unfortunately, most stressed-type designs are not intended for continuous exposure to the elements. For best results, a stressed antenna must be guyed in position, eliminating the ability to change satellites easily.

Is there a simple way to spot potential obstructions between my antenna and the satellites?

Go to your tentative site and look due south. Raise your arm to about 45 degrees from horizontal. Sweep your arm across the sky, dropping it down as you move to the east or west. If you live in the central United States, this will give you a rough idea of the satellites' location. If there are trees, buildings, or other obstructions that look risky, take the time to run a serious check on the site.

What is the maximum distance I can have between my TV set and the satellite antenna?

If you are using a single-conversion receiver where the downconverter is located at the antenna and a 70-MHz signal is sent to the house, there can be as much as a 100-foot run of RG-8/U coaxial cable (or perhaps a good grade of RG-58) without losing a noticeable amount of the signal due to cable loss. If your system requires that you relay a 4-GHz signal, it will be necessary to run hardline or heliax cable, which costs as much as $4 per foot, or about ten times the cost of RG-8/U. If you do use a good grade of hardline, it can usually be 80 to 100 feet long before the losses catch up and degrade the picture. Line amplifiers can be added to increase this distance, but the cost may be prohibitive.

My neighbor is considering installing her own TVRO. Could that interfere with my system?

Just as hams living next to each other sometimes have interference problems, so can adjacent TVRO systems. The difficulty usually stems from local oscillator (LO) leakage. This unit typically has 10 milliwatts of output, and if it is not well shielded, a signal will be radiated. If your neighbor wants to receive a signal on the same frequency that your LO is operating on, there could be a problem. Dual-conversion receivers or well-shielded single-conversion designs go a long way towards reducing the interference.

What is an Az-El mount?

This type of mount allows you to move a dish vertically (El) and horizontally (Az). In my opinion, this is the hard way to do things unless you are chasing satellites that move, like Russia's Molniya birds. If you'll be watching only the geosynchronous satellites, a polar mount is probably more useful.

OK, what's a polar mount?

The polar mount allows you to rotate the dish from east to west or vice versa and keep the axis of the dish in line with the axis of the Earth. You can align the axis for a polar mount by using the North Star as a guide. When you sweep your dish across the sky, it will not be necessary to make any significant adjustments in the elevation if you have a polar mount.

What is a "tree" mount?

There is no strict definition for a tree mount. All you do is prop your dish against a handy tree, the side of a building, or anything else that is convenient. This kind of mount is useful if you are in too much of a hurry to build a polar or Az-El mount.

How do I center the feedhorn on a dish?

To place the feedhorn at the focal point requires measurement from the center of the feedhorn's mouth to the edge of the dish. This distance should be the same to all points on the edge.

When I was positioning my feedhorn, I found a better signal when the horn was slightly off center. Why?

If your signal improves when the horn is not centered, there may be two culprits: The dish is not pointed directly at the chosen satellite or the antenna's surface is warped, causing the actual focal point to differ from the theoretical focus. A distorted dish may have one or more false "hot" spots. On a well-built dish that is pointed directly at the satellite, your best signal will be found when the feedhorn's mouth is at the calculated focal point.

I have a good dish and I know it is pointed right; I still get two hot spots, one at the edge of the feedhorn mouth, the other just inside the horn. What gives?

When you move the horn back and forth through the focal point, there will be two distinct "hot" spots. The wave pattern has an hourglass shape since the impedance seen by the arriving signal changes according to the distance. The hot spot that is closest to the dish is the most efficient because it offers a narrow bore sight. This means that the focal point will lie about ¼ to ½ inch inside the horn.

When placing the horn, which is more critical, moving the mouth from side to side or moving it towards and away from the dish?

A two-inch shift to one side can result in as much as a 3-dB drop in signal level while a two-inch movement in or out will result in a 1-1.5-dB loss. Concentrate on lining up the side-to-side dimension.

As I sweep my dish across the sky, there is a slight "image" signal about four degrees on either side of the bore sight position for a particular satellite. What is this?

I discovered the same thing when I was installing a new antenna. First I thought it was a new satellite. After disproving that theory, I spent many hours carefully refocusing my antenna. Finally, after a lot of reading, I discovered that any parabolic antenna that is not perfect will exhibit side lobes. These will allow you to receive signals that are much weaker than those you find with the major lobe pointed at the satellite. The better the dish, the less prominent the side lobes.

Why do I receive vertical transponders better than horizontal transponders on the same satellite?

On Satcom F1, the vertical transponders were slightly stronger than the horizontal ones, but the one-half-dB difference was not enough for most hobbyists to notice. If you have a noticeable difference between the two polarities, it may be the result of inaccuracies in the antenna's surface. ■

SATELLITE TV SYSTEMS

"COMPARE OUR QUALITY, PRICES AND SERVICE!"

WE MANUFACTURE:

- PARABOLIC DISHES
- POLAR MOUNTS
- DEMO TRAILERS
- MOTORIZATION SYSTEMS
- LNA HOLDERS
- ALUMINUM HORNS

WE STOCK

- WASHBURN
- KLM
- AVANTEK
- GARDINER
- ALLIANCE
- ATV
- CABLE & CONNECTORS
- SWITCHES & HARDWARE

CALL, WRITE OR ✓ FOR OUR LATEST BROCHURE AND PRICES.

AUSTIN C. LEWIS
K4GGC
901-784-2191

LEWIS CONSTRUCTION CO.
P.O. BOX 100
HUMBOLDT, TN. 38343

"IN BUSINESS AT THIS LOCATION SINCE 1964" ✓452

8FT

PARABOLIC DISH

- NO WARP, CHIP, OR DELAMINATION
- ALL-STEEL, ONE-PIECE
- ACCURATELY MACHINED
- 8′4½″ OVERALL DIAMETER WITH MOUNTING RING

MOUNT AVAILABLE

Write for quantity discount

DAKOTA MICROWAVE
P.O. BOX 27002
GOLDEN VALLEY, MN 55411

AT MINNEAPOLIS MN.

AVAILABLE NOW

NEW!

AZDEN PSC-300

TWO-METER HANDHELD

PCS-300 HT	$290.00
PCS-3000 XCVR	285.00
Remote cable	37.00
Phase II ant.	28.50
Other acc.	Call

KDK

also: 2025A Mk II (W/TT mic.) **$265.00**

Free shipping in U.S.A. for all XCVR or HT orders

B. G. CARL ELECTRONICS
11128 Claire Ave.
Northridge, Calif. 91326 ✓469
Call: (213) 363-1216—anytime

BUCK'S ROCK

Summer Camp

(212) 362-2702

Connecticut summer camp seeks counselors (age 21+) to work with teenagers in its ham radio program during July & August. Apply Buck's Rock—K1PGO, 140 Riverside Drive, New York, N.Y. (212) 362-2702

K1PGQ

HAMVENTION '82 DAYTON

- ★ Technical Forums
- ★ ARRL and FCC Forums
- ★ GIANT 3-Day Flea Market
- ★ New Products and Exhibits
- ★ Grand Banquet
- ★ Women's Activities
- ★ New! Home-Brew Equipment Forum
- ★ Special Group Meetings
- ★ YL Forum
- ★ New! Personal Computers Forum
- ★ Amateur of Year Award
- ★ Special Achievement Awards

April 23, 24, 25, 1982

Hara Arena and Exhibition Center — Dayton, Ohio

Meet your amateur radio friends from all over the world at the internationally famous Dayton HAMVENTION. Seating will be limited for Grand Banquet and Entertainment on Saturday evening so please make reservations early. Banquet speaker is Roy Neal, K6DUE, NBC News.

If you have registered within the last 3 years you will receive a brochure in late February. If not write Box 44, Dayton, OH 45401.

Nominations are requested for Radio Amateur of the Year and Special Achievement Awards. Nomination forms are available from Awards Chairman, Box 44, Dayton, OH 45401.

For special motel rates and reservations write to Hamvention Housing, 1406 Third National Bldg., Dayton, OH 45402. **NO RESERVATIONS WILL BE ACCEPTED BY TELEPHONE.**

All other inquiries write Box 44, Dayton, OH 45401 or phone (513) 849-1720.

Rates for ALL 3 Days: Admission: $7 in advance, $8 at door.
Banquet: $14 in advance, $16 at door.
Flea Market Space: $15 in advance.

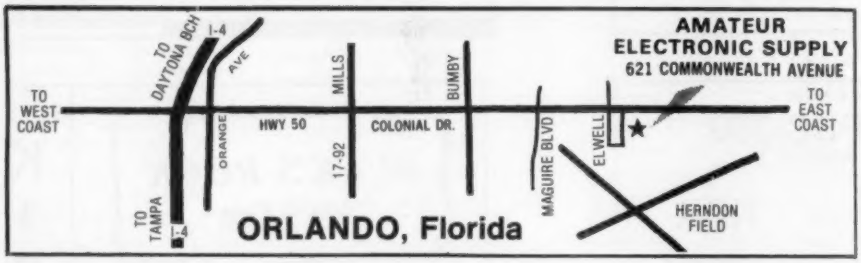
Make checks payable to Dayton HAMVENTION, Box 333, Dayton, OH 45405.

Bring your family and enjoy a great weekend in Dayton.

Sponsored by the Dayton Amateur Radio Association, Inc.

AMATEUR
ELECTRONIC
SUPPLY

When touring
FLORIDA
be sure to
visit the
**AMATEUR
ELECTRONIC
SUPPLY**
Branch Stores
located at:


AMATEUR
ELECTRONIC SUPPLY
621 COMMONWEALTH AVENUE
TO DAYTONA BCH
I-4
AVE
ORANGE
MILLS
17-92
BUMBY
TO WEST COAST
HWY 50
COLONIAL DR.
MAGUIRE BLVD
ELWELL
TO EAST COAST
TO TAMPA
I-4
ORLANDO, Florida
HERNDON FIELD

621 Commonwealth Ave.
ORLANDO
Phone: (305) 894-3238
Florida in-State WATS:
1-800-432-9424
Nationwide:
1-800-327-1917
- & -
1898 Drew Street
CLEARWATER
Phone: (813) 461-4267

ELECTRONIC SUPPLY

Visit our
Wickliffe, Ohio
(Cleveland area)
Branch Store
28940 Euclid Avenue
Phone (216) 585-7388
Ohio in-state WATS
1-800-362-0290
Nationwide:
1-800-321-3594

Conveniently located on the far east side of Cleveland, just 4 blocks east of the Euclid Avenue exit of I-90.

• LARGE STOCKS • FAST SERVICE - AES ships Coast to Coast

We're Growing! - and to serve you better, this large, modern Office and Warehouse complex will become the future mail order Headquarters for AMATEUR ELECTRONIC SUPPLY in Milwaukee, Wisconsin.

New AES Branch Store in LAS VEGAS at 1072 Rancho Road; Phone: (702) 647-3114; Outside Nevada WATS: 1-800-634-6227.

In CHICAGO visit our Associate Store - ERICKSON COMMUNICATIONS at 5456 N. Milwaukee Avenue; Phone: (312) 631-5181

Call Toll Free: 1-800-558-0411

*In Wisconsin (outside Milwaukee Metro area)
1-800-242-5195*

AMATEUR ELECTRONIC SUPPLY® *Inc.*

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 Phone (414) 442-4200

TRAC

TRAC*ONE + DELUXE CMOS KEYER

$119.95

Features: **Model TE-464**

- True CW signal reproduction—Single signal reception
- Removes all QRM and QRN
- Digs out CW signal, decodes it with Phased Lock Loop Tone Decoder then reproduces it with full operator control over Gain, Freq, Tone, Delay.
- All controls on front panel
- Freq control variable 300 Hz to 2500 Hz will match any rig.
- LED flashes during decoder operation
- Operates in line with rig audio--leave in line on OFF/BYPASS
- Built in speaker
- Headphones jack rear panel
- Battery or AC-adaptor, 9VDC operation

PLUS:

- Deluxe CMOS Keyer—"State-of-the-art" CMOS circuitry
- Self-completing dots and dashes
- Both dot and dash memory
- Iambic keying with any squeeze paddle
- 5-50 w.p.m.
- Speed, Volume, Tone, Tune and Weight controls
- Sidetone and speaker
- Semi-auto switch for bug or straight key
- Deluxe quarter-inch jacks for keying and output
- Keys grid block or solid state rigs

TRAC*ONE CW PROCESSOR

$89.95

Features: **Model TE 424**

- True CW signal reproduction—Single signal reception
- Removes all QRM and QRN
- Digs out CW signal, decodes it with Phased Lock Loop Tone Decoder then reproduces it with full operator control over Gain, Freq, Tone, Delay.
- All controls on front panel
- Freq control variable 300 Hz to 2500 Hz will match any rig.
- LED flashes during decoder operation
- Operates in line with rig audio—leave in line on OFF/BYPASS
- Built-in speaker
- Headphones jack rear panel
- Battery or AC-adaptor, 9 VDC operation ✓76

SEND FOR BROCHURE ON OUR FULL PRODUCT LINE

TRAC ELECTRONICS, INC.
1106 RAND BLDG.
BUFFALO, NY 14203
(716) 852-8188

HT-Power!

The Pefect Pair

SUPER STICK II

2 METER 5/8 WAVE TELESCOPIC ANTENNA

PLUS

A DUCK FOR UNDER A BUCK

$\$19^{95}$ + 1¢

FOR THE DUCK

	PRICE	GAIN *	BASE CONNECTOR **	FULLY COLLAPSED
SUPER STICK II	$\$19.^{95}$	6-9 DB	BNC-Tempo 5/15-32 TNC-F—50239	Collapsed is a matched 1/4 Wave Antenna
BRAND C	$\$26.^{95}$	6-9 DB	BNC ONLY	NA Will not transmit in collapsed position.
BRAND V	$\$24.^{95}$	5-8 DB	BNC ONLY	NA Will not transmit in collapsed position.

* Measured Field Strength Over Rubber Duck
** Specify Base Type BNC, Tempo, Ect.

RD2S Stubby

The Tuned Antenna Company brings you the Super Stick II for those long hauls with your H.T., plus our 5/8 Wave Antenna may be operated collapsed with the same operating characteristic of a Rubber Duck Antenna. The Super Stick II is available with Tempo S-1, BNC-TNC-F-PL-259 Bases at a price that is several bucks under other 5/8 Wave Antennas, making the Super Stick II the best buy around. See your local dealer for stock. Settle for nothing less than a Super Stick II.

FOR DEALER LOCATION
OR TO ORDER CALL:
(714) 268-0720

VISA

master charge

THE TUNED ANTENNA CO.

9520 Chesapeake Dr. #606
San Diego, California 92123

✓57

Timothy Edwards
c/o Ambit International
200 North Service Road
Brentwood, Essex CM14 4SG
England

VHF Converter

—easy to build, yet state of the art

Editor's Note: This state-of-the-art VHF converter design is reprinted from the British publication *Radio and Electronics World.* A complete parts kit is available from RadioKit, Box 411, Greenville NH 03048. The special TOKO coils are available from Ambit International, 200 North Service Road, Brentwood, Essex CM14 4SG, England.

Despite the plethora of ready-made equipment for the 2-meter (144-148 MHz) amateur communication band, most radio enthusiasts like to try to salve their consciences as participants in the once exclusively "practical" art of amateur radio by making at least one or two items of equipment that can justifiably be described as "home grown."

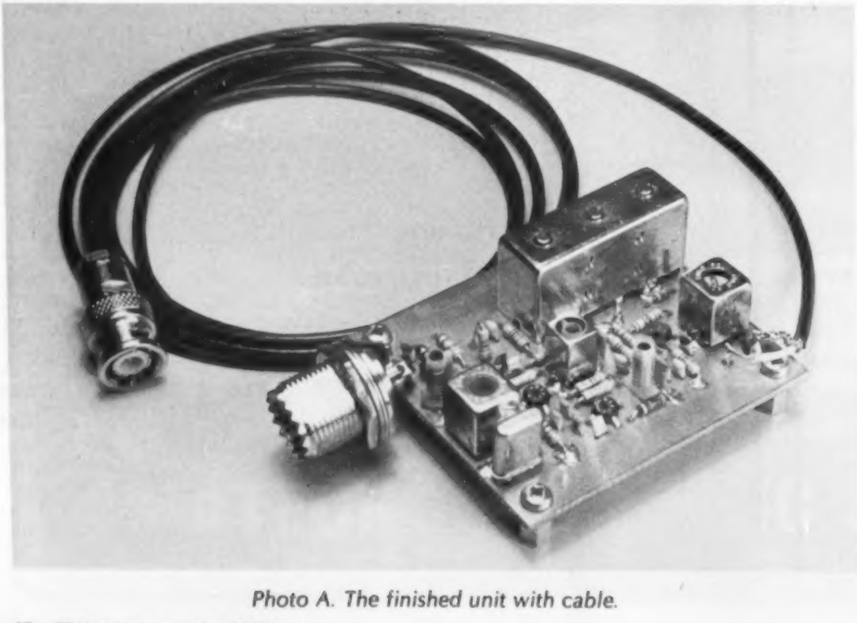


Photo A. The finished unit with cable.

Most of the commercial transceivers for the VHF bands are primarily FM systems for simply "nattering," and some of the hobby's traditionalists might suggest that the use of 2m NBFM bears more than a passing resemblance to the principles behind CB radio—but that's an entirely more contentious subject...

The exclusive use of NBFM tends to overlook the more interesting aspects of CW and SSB communications (Morse code and single sideband to the uninitiated). But since most enthusiasts have an HF communications receiver (or two) at their disposal, it is an easy enough task to

Specifications

Noise figure	less than 2 dB
Gain	28 dB nominal
3-dB bandwidth	144-146 MHz
I-f output	28-30 MHz
1-dB compression	+ 5-dB output
Saturated output	+ 7 dBm
Supply voltage	8-16 V
Supply current	15 mA nominal
In-out impedance	50 Ohms
Size	70 × 60 × 20 mm

make a thoroughly professional converter for 144-146 MHz, with an i-f output to be tuned on the 28-30-MHz section of the HF receiver. The radio enthusiast may thus fulfill the repressed constructional instinct, as well as be able to have a serious look at the CW and SSB aspects of the 2-meter band before launching into a few hundred dollars worth of oriental temptation.

The converter is basically a linear device within the expected range of input signal levels, so any mode (AM, FM and SSB) can be converted to the required HF output. Some HF receivers are available with NBFM demodulators, but to do the job properly, the correct bandwidth i-f filter needs to be used with a purpose-made NBFM i-f system. In the absence of this facility, slope detection of NBFM is better than nothing. (Slope detection relies on the i-f filter passband edge to translate the frequency modulation information into an amplitude variation for detection as simple AM.)

Judging by the numbers of "nearly new" SSB transceivers advertised for sale, it is no doubt better to investigate your long-term interest in this aspect of communication without first contributing to the wrong side of the balance of payments. This converter provides reception of repeaters, NBFM simplex, and demanding long-range communications using CW or SSB.

The 2-Meter Converter

This converter was originally designed to complement the RX80 receiver described in the British magazine *Radio Communication*, although it will obviously operate with such receivers as the FRG-7, R1000, DX160, etc. It has been designed with the latest state-of-the-art components, notably the NEC 3SK88 MOSFET which has been chosen for its repeatably low noise figure and low cost. The TOKO CBT series helical filter provides an outstanding bandpass and stopband response, but most significantly of all from the point of view of those of you wishing to duplicate this converter, it is supplied prealigned and requires virtually no trimming to optimize alignment.

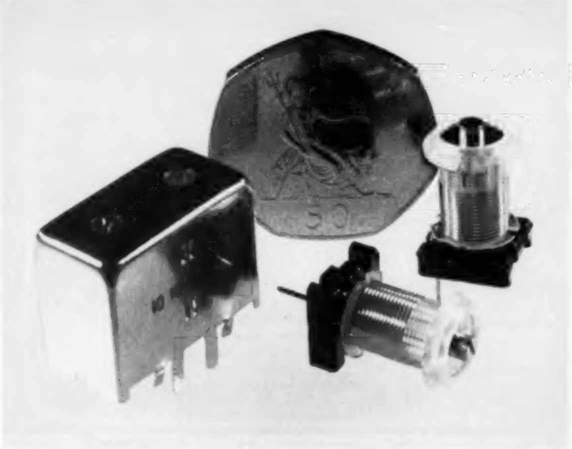


Photo B. An exploded view of the 2-pole version of the helical filter.

Although a VHF converter usually requires considerable expertise and recourse to a selection of signal generators and other analytical equipment, the converter can be built by anyone with kit building experience and a multimeter.

Circuit Description

Fig. 1 shows the complete circuit diagram. C1, C2, and L1 provide the optimum noise match between the 50-Ohm antenna input and the rf amplifier—this is a carefully derived selection of values, and not simply a haphazard choice from the junk box. Gate 2 of Q1 is biased at 5 V (externally derived—i.e., from the main receiver or tuneable i-f—negative-going agc may be applied at this point by those with adequate confidence and experience). The source of the rf amplifier, Q1, is then taken directly to ground to ensure minimum impedance.

The drain of Q1 is taken to the supply through R3, which provides the correct terminating impedance to the helical resonator, L2,

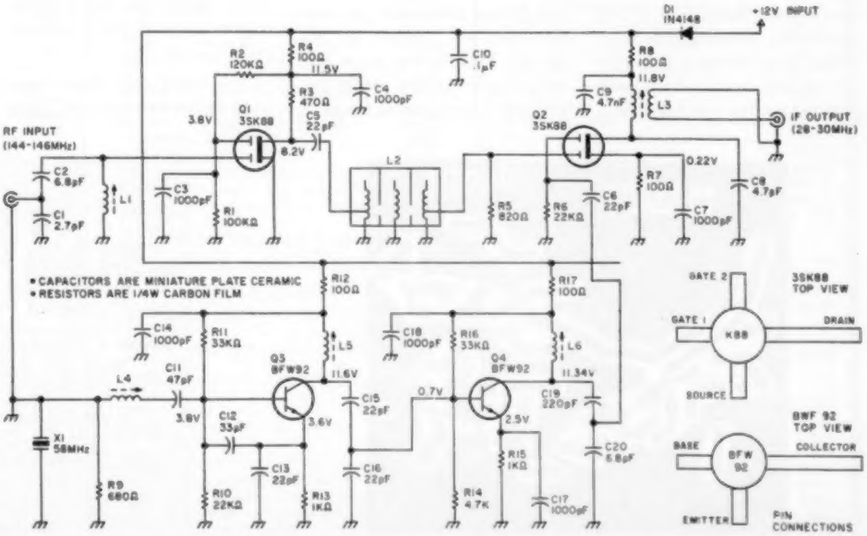

RF INPUT (144-146MHz)
C2 6.8pF
C1 2.7pF
L1
C3 1000pF
R1 100KΩ
3.8V
Q1 3SK88
8.2V
R2 120KΩ
R4 100Ω
11.5V
R3 470Ω
C4 1000pF
C5 22pF
L2
C10 .1µF
D1 IN4148
+12V INPUT
R8 100Ω
11.8V
C9 4.7nF
L3
Q2 3SK88
IF OUTPUT (28-30MHz)
0.22V
R5 820Ω
R6 22KΩ
C6 22pF
R7 100Ω
C7 1000pF
C8 4.7pF
• CAPACITORS ARE MINIATURE PLATE CERAMIC
• RESISTORS ARE 1/4W CARBON FILM
R12 100Ω
R17 100Ω
C14 1000pF
R11 33KΩ
L5
Q3 BFW92
11.6V
L4
C11 47pF
3.8V
C12 33pF
3.6V
C13 22pF
C15 22pF
C16 22pF
X1 58MHz
R9 680Ω
R10 22KΩ
R13 1KΩ
C18 1000pF
R16 33KΩ
0.7V
Q4 BFW92
L6
11.34v
C19 220pF
2.5V
R15 1KΩ
C20 6.8pF
R14 4.7K
C17 1000pF
GATE 2
3SK88 TOP VIEW
GATE 1
K88
DRAIN
SOURCE
BWF 92 TOP VIEW
BASE
BFW 92
COLLECTOR
EMITTER
PIN CONNECTIONS

Fig. 1. Circuit diagram.

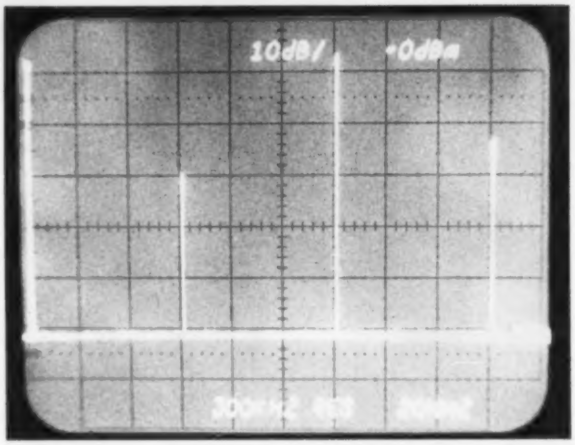


Photo C. The spectrum of the LO multiplier output (10 dB per vertical division, 20 MHz per horizontal division).

which has an input and output impedance of approximately 450 Ohms. The output of L2 is connected straight to the gate of the mixer, Q2, R5 providing the necessary extra load in parallel with gate 1 of Q2 for a correct 450-Ohm matching load.

The appearance in the market of low-cost helical filter blocks (Photo B) will probably change the approach to VHF designs, since yet another circuit variable has now been substituted by a building block that takes out most of the problems for the less-experienced designer and user. More than 75% of the problems associated with VHF radio designs are simply those associated with getting lost in the MHz as a result of the uncertainties of DIY coil designs.

Helical filters will not salvage designs that fall into the all-too-familiar abyss of "dry" joints and a shortage of basic experience in handling components and a soldering iron—but these filters will help allay the fears of the more experienced audio constructor whose neat rf projects have always been relegated to the "pending" tray, since the problems of alignment associated with the green fingers of the rf engineer sometimes seem insurmountable.

Unlike the rf amplifier, the mixer does not use any dc bias on either of its gates. This is because the amplitude of the local oscillator injection voltage is designed to be sufficient to switch Q2 *directly* at 116 MHz, thereby improving the intermodulation performance of the converter. This technique is used in some professional receivers and is similar in concept to the esoteric Schottky diode double balanced mixer—except, of course, that this system is single ended. It is possibly the first time that this approach has been used in an enthusiast's constructional feature. Unless you know better . . .

At the drain of Q2, the wanted mixer product (28-30 MHz) is selected in the tuned circuit formed by L3 and C8 and matched at the secondary to 50 Ohms to feed the main receiver. It is this output network that mainly constitutes the 3-dB bandwidth of the converter. This means that the gain is approximately 25 dB at 144 MHz, 28 dB at 145 MHz, and 25 dB at 146 MHz. This reduction of gain is of no consequence as the design has plenty in hand at all times.

It should be noted that the ultimate sensitivity of any receiving system is defined by its noise figure and *not* its gain. This means that the sensitivity will be the same over at least 144-146 MHz, although the S-meter might read slightly less at the band edges.

The oscillator chain uses a 38.667-MHz crystal rather than the more usual 116-MHz type. Transistor Q3 serves the function of both oscillator and frequency doubler. L4 tunes out the capacitive reactance presented to the third overtone crystal and allows fine adjustment of its operating frequency. L5, C15, and C16 select the third harmonic from the oscillator at 116 MHz and match it into Q4 where it is amplified to an adequate level to switch the mixer, Q2. The capacitive divider, C19 and C20, provide the necessary level and impedance adjustment to feed the oscillator injection of approximately 2 mW to gate 2 of Q2.

On a general point about decoupling, note the way in which tuned circuits are decoupled with capacitance and inductance. Taking the example of L3 (R8/C9), R8 is apparently superfluous.

This presumes that there is zero ac impedance to the rf ground on the positive supply rail which—for reasons of the effects of lead inductance and the unpredictability of stray coupling at VHF—is certainly not always the case. Thus the low-pass filter formed by the RC combination provides a far more positive and reliable method for keeping the rf off the supply line. The danger of creating a positive feedback loop somewhere in the physical (as opposed to the-

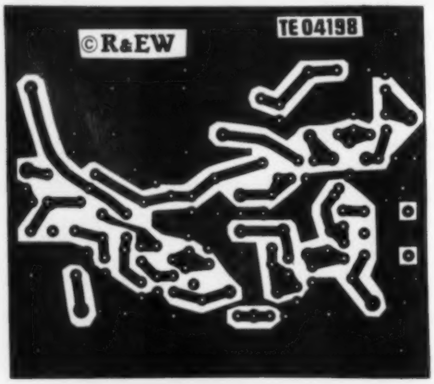


Fig. 2. PC board layout.

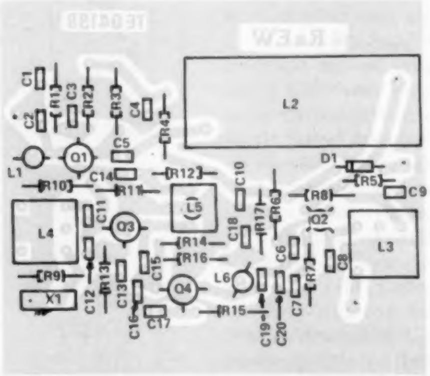
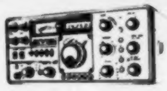


Fig. 3. Parts placement.

DAYTON HAMVENTION CELEBRATION SALE

You Can Bank on Us for More Than Just Low Prices.

YAESU



SAVE $186.00 on FT902 DM

HF TRANSCEIVERS

FT-ONE 9 Band xcvr w/FP-107, w/O FM	$2695.00
FT-107M/DMS 9 Band xcvr, digital	$1034.00
FT-101ZD MKIII 9 Band xcvr, digital	$799.00
FV-101DM Synth., scanning VFO	$323.00
FT-902DM 9 Band xcvr. digital	$1349.00
YO-901P Monitor scope w/panadapter	$469.00
FV-901DM Remote VFO w/memory	$373.00
FT-707 8 Band, Mobile xcvr	$729.00
FP-707 Power Supply	$145.00
FTV-707 Transverter w/o Module	$116.00
2M Module only	$138.00
6M Module only	$99.00
70CM Module only	$229.00

VHF-UHF TRANSCEIVERS

FT-680R 6M SSB/FM/CW/AM xcvr	$468.00
FT-480R 2M SSB/FM/CW xcvr	$476.00
FT-780R 70CM All Mode xcvr	$699.00

VHF-UHF HAND-HELDS

FT-208R 2.5W 2M FM HT w/TTP	$323.00
FT-708R 1W 440 FM HT w/TTP	$323.00

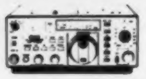
VHF PORTABLES

FT-690R 6M FM/SSB xcvr.	$339.00
FT-290R 2M FM/SSB xcvr	$359.00

FULL LINE AVAILABLE ON SALE

All accessories 10% off w/ Radio Purchase

ICOM



HF TRANSCEIVERS

IC-720A Digital HF xcvr, General Coverage Rcvr. All 9 HF Bands, 2VFOs	$1199.00
IC-730 Solid State, Digital xcvr, 8 Bands, 2 VFOs, 1 Memory per band	$729.00
PS-15 Power Supply	$135.00
PS-20 Power Supply	$199.00
Phone Patch Specify 730 or 720A	$125.00
AT-100 100W auto antenna tuner	$314.00
AT-500 500W auto antenna tuner	$399.00

VHF-UHF TRANSCEIVERS

IC-290A All Mode 2M xcvr, 2 VFOs 5 Memories, 1/10 Watts, scan	$489.00
IC-25A Compact, 2M xcvr, 2 VFOs, 5 Memories, Scan, 1/25W	$314.00
IC-251A 2M All Mode **SUPER SPECIAL**	$599.00
IC-451A UHF All Mode Base Station	$799.00
IC-551 6M All Mode Base Station	$429.00

HAND-HELD	w/o TTP	w/TTP
IC 2A/2AT 2M, Hand held	$216.00	$242.00
IC 3A/3AT 220, Hand held	$242.00	$269.00
IC 4A/4AT 440, Hand held	$242.00	$269.00

FULL LINE AVAILABLE ON SALE

All accessories 10% off w/ Radio Purchase

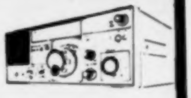
★ THIS MONTH'S SPECIAL ★

TEMPO S4 Hand Held

Reg. $349 **SALE $199.00**

Limited to EEB stock.
Warranty handled by Henry Radio.

YAESU



SAVE $70.00 on FRG-7700

SWL DX HEADQUARTERS

Yaesu FRG7700 150 KHz-30 MHz Digital rcvr	$479.00
Yaesu MU7700 12 Ch. Memory Unit	$135.00
Yaesu FRG-7 .5-29.9 MHz rcvr	$289.00
Kenwood R-1000 .15-30 MHz	$449.00
Kenwood R-600 .15-30 MHz	$359.00
Panasonic RF-3100 .1-30 MHz & FM	$289.00
Panasonic RF-2200 MB-SW-FM	$159.00
Sony ICF-2001 Digital, Compact	$299.00
Sony ICF-6500 (New) Digital	$199.00
Palomar Loop Amp./Ant.	$77.50/$59.95
Info-Tech M200F RTTY-CW/Video out	$549.00
McKay Dymek DA-100D Active Ant.	$129.00
Kantronic Mini-Reader	$249.00
World Radio TV Handbook 1982	$16.50

Call or write Today for all your Test Equipment Needs.

TEST EQUIPMENT SPECIALISTS FOR OVER 10 YEARS.

Scopes, Counters, DMM, Generators, Power Supply

HITACHI SCOPES
N.A. SOAR
LEADER
FLUKE
BECKMAN

BIRD ELECTRONIC
B&K DYNASCAN
AMPHENOL
ASTRON

EEB

Electronic Equipment Bank

Just 10 miles west of Wash., D.C.

516 Mill Street, N.E.
Vienna, Virginia 22180

(703) 938-3350

Plan a visit next time you're in Washington, D.C.

The Antenna Bank

(703) 569-1200

6460H General Green Way
Alexandria, VA 22312

HUSTLER

4BTV 40-10 Mtr. Vertical		$74.00
5BTV 80-10 Mtr. Vertical		$93.00
M01/M02 HF Mobile Mast		$18.00
HF Mobile Resonators.	Std. 400W	SUPER 2KW
10 or 15m	$8.00	$13.00
20m	$11.00	$15.00
40m	$13.00	$18.00
75 or 80m	$14.00	$28.00
BM-1 Bumper mt. with S.S. Strap		$13.00
SSM-2 Commercial S.S. Ball		$14.00
SF-2 5/8 Wave, 2 Meter Antenna		$9.00
HOT Hustloff Mt. with Swivel ball		$14.00
G6-144B 2M Colinear, fixed Station, 6db		$68.00
G7-144 2M Colinear, fixed Station, 7db		$99.00

Full Line Available on Sale Call

ROHN

20G 10 ft. Stacking Section	$32.00
25G 10 ft. Stacking Section	$39.50
45G 10 ft. Stacking Section	$87.50
25AG 2,3 or 4 Top Section	$52.50
HDBX 48 48 ft. Free Standing Tower	$320.00
HBX56 56 ft. Free Standing Tower	$340.00
FK2548 48 ft. 25G Foldover Tower	$725.00*
TB3 Thrust Bearing	$48.00
SB25G Short Base for 25G	$16.50
BPH25G Hinged Base Plate	$59.75
AS25G Accessory Shelf	$9.50
HB25AG 14" House Bracket	$14.50
BPC25G Cement Base Plate	$32.00
BAS25G Short top section w/acc. shelf	$38.00
M200 16 gauge, 10 ft, 2" *.D. Mast	$19.50
M200H 1/8" wall, 10 ft. 2" O.D. Mast	$36.00

Freight prepaid on Fold-over towers. Prices 10% higher west of Rocky Mts.

Philly Stran Guy Cable in stock - for price and delivery call (703) 569-1200

VISA **ORDERS ONLY** master charge

800-336-8473

- Shipping charges not included
- Prices subject to change without notice
- Some items limited to stock only
- Limited quantities
- No COD's

HY-GAIN

TH3JRS Jr. Thunderbird, 750W PEP	$150.00
HQ-2S Hy-Quad, 2 Element	$235.00
TH5DXS Thunderbird, 5 Element	$215.00
TH3MK3S Thunderbird, 3 Element	$195.00
TH2MK3S Thunderbird, 2 Element	$128.00
TH7DX Thunderbird, 7 Element	$336.00
392S TH6DXX Conversion Kit to TH7DX	$135.00
105BAS 5 Element 10m "Long-John"	$114.00
155BAS 5 Element 15m "Long-John"	$161.00
205BAS 5 Element 20m "Long-John"	$269.00
14AVQ/WBS 10-40m Vertical	$49.95
18AVT/WBS 10-80m Vertical	$87.50
V-2S Colinear Gain Vertical 138-174 MHz	$33.75
BN-86 Ferrite Balun, 10-80 meters	$13.00
HDR-300 Deluxe Rotor, Digital Readout	$378.00

★ SUPER HY-GAIN PACKAGE ★

SAVE $355.15 Plus FREE DELIVERY*

SALE $1,306.70

HG53SS 52 ft. Self-Supporting Crank-up Tower	$990.00 Value
HG-COA 3 each Coax arm for Tower Legs	$39.00 Value
TH5DXS Thunderbird, 5 Element Triband	$319.95 Value
HAM IV Rotor	$237.95 Value
HG-10 10 ft. mast 2" O.D. 120 Wall Steel	$56.00 Value
BN-86 Ferrite Balun	$18.95 Value

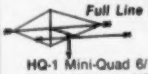
Free delivery offered for shipping points within 48 States. ADDED BONUS: Include M.O. or Certified Ck. with order and receive a Van Gordon PD-8040 Dipole FREE.

NO SUBSTITUTIONS PLEASE. SALE ENDS 4/30/82.

CUSHCRAFT

A3 3 Element Triband Beam	$167.00
A4 4 Element Triband Beam	$204.00
A743 7 & 10 MHz Add On for A3	$55.00
A744 7 & 10 MHz Add On for A4	$55.00
AV3 3 Band Vertical 10-20m	$41.00
AV4 4 Band Vertical 10-40m	$82.00
AV5 5 Band Vertical 10-80m	$88.00
R3 14,21,28 MHz Ringo	$204.00
32-19 Boomer 19 Element 2m	$75.00
214B Jr. Boomer 14 Element 2m	$61.00
A147-11 2m 11 Element Antenna	$34.00
A147-4 2M 4 Element Antenna	$23.00
ARX-2B 134-164 MHz Ringo Ranger II	$34.00
A144-10T 145 MHz 10 Element	$41.00
A432-20T 432 MHz 20 Element	$41.00
A14T-MB Twist Mounting Boom & Bracket	$21.00

Full Line Available on Sale Call



MINI-PRODUCTS

HQ-1 Mini-Quad 6/10/15/20m Antenna	$129.95
B-24 2 Element HF Mini-Beam 6/10/15/20m	$99.00
RK-3 3rd Element Add-on for B-24, Improves 10-20m	$67.00
C-4 Mini-Vertical 6/10/15/20m	$59.00

ROTORS & CABLES

CDE HAM IV Rotor	$175.00
CDE T2X Rotor	$244.00
CDE 45 Rotor	$82.00
Alliance HD-73 Rotor	$92.00
Alliance U100 Rotor	$42.00
RG-8/U Foam Coax 95% Shield	24¢/ft.
RG-213 Coax, Mil. Spec.	28¢/ft.
Mini-8 Coax 95% Shield	12¢/ft.
Rotor Wire 8 Conductor	16¢/ft.
4 Conductor	7.5¢/ft.

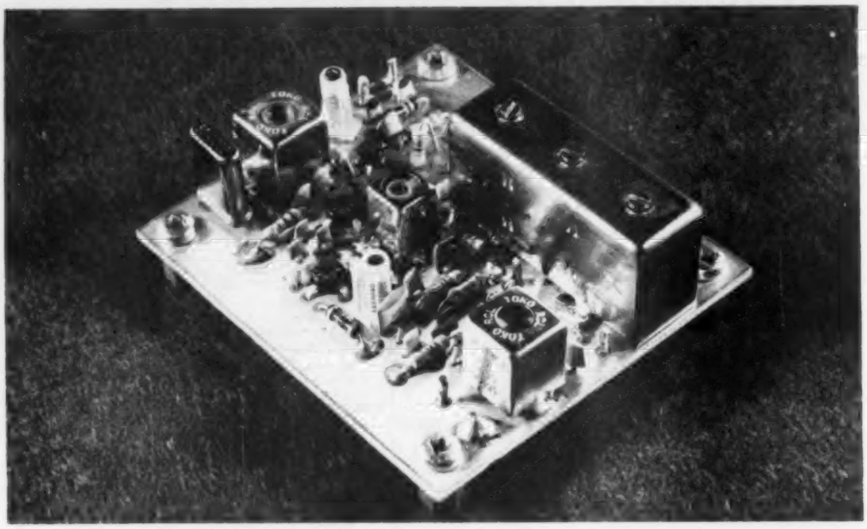


Photo D. The completed converter PCB.

oretical) circuit layout is thereby greatly reduced.

D1 provides reverse polarity protection, which most readers with practical experience will have discovered is essential when connecting things up in a hurry. Strangely enough, this simple and effective precaution is omitted from many designs. Perhaps more components get sold that way.

Construction And Alignment

Using the PCB and components placement guide (Figs. 2 and 3), assemble the converter. Do not forget to solder the earthy legs of R1, R5, R6, R7, R9, R13, R14, and R15—and also the can legs of L2, L3, L4, and L5. There are no critical or easily-damaged components, although due to their size it is advisable to leave the coils and helical filters until last.

After construction is completed, remove any solder splashes, check for dry joints, and remove the flux residue. Connect to a 12-V regulated power supply and check that the current consumption is about 10 mA without the crystal fitted.

Preset coils L1, L5, and L6 so that their cores are flush with the top of their formers. At this stage, do not touch L2, L3, and L4.

Connect a voltmeter between Q3 emitter and ground; the voltage should be approximately 3.2 V. Plug in the crystal, and the voltage should rise to about 3.5 V; slightly adjust L4 for maximum reading. Transfer the meter to Q4 emitter, and adjust L5 for maximum reading—which will be about 3.5 V. If the crystal is removed, the voltage will fall to approximately 0.48 V. Transfer the meter to the source of Q2 and adjust L6 for maximum reading. This will be about 0.15 V to 0.3 V, depending on the IDSS of Q2; there will be less than 0.1 V present with the crystal removed.

Connect a 50-Ohm aerial to the 2-meter input and a suitable receiver to the output via a 50-Ohm coax lead. Don't bother to tuck it all away neatly into a case/box just yet, since there is a reasonable chance that you will need to do some work on the unit to get everything working perfectly.

Tune to a weak signal around 145 MHz (the output will tune to 29 MHz) and adjust L3 for maximum output using the receiver's own S-meter. Adjust L1 for maximum signal-to-noise by ear, and do *not* use the S-meter if optimum results are required. Maximum gain does *not* coincide with minimum noise figure.

Unless you have the necessary equipment to sweep the 2-meter band with a spectrum analyzer and signal generator, do not adjust L2. There is little point anyway, as the helical resonator has been very accurately set up during the course of its manufacture and test, and no improvement could be effected on the samples tested. This is not unexpected, as TOKO offers an unparalleled repeatability in their ranges of high quality rf and i-f coils. Experience has shown them to be suitable for most demanding applications, and, indeed, there are hardly any high-quality receivers that do not use some.

The bandpass characteristic over 144-146 MHz shows a perfect textbook response (Photo C). The helical filters were originally designed for use by manufacturers of Oriental "black boxes." If you take the lid off some Kenwood and Standard equipment, you probably will find one of these devices lurking near the receiver front end.

The remaining adjustment is to put the converter onto the correct frequency, but this is not important unless the receiver itself has an accurate frequency readout. If it has, then tune to a known frequency such as a beacon signal or a repeater and adjust L4 so that output frequency corresponds to the known input signal. For example, a repeater on R6 (145.75 MHz) reads 29.75 MHz on the main receiver display.

This completes the alignment, and it is gratifying to be able to comment that no problems have occurred with stability in any examples tested so far—doubtless due to the carefully designed double-sided printed circuit board.

Conclusions

Once you are confident that all is well, fit the completed PCB into an appropriate container and fit

Parts List

(Capacitors are miniature plate ceramic.)
C1—2.7 pF
C2, C20—6.8 pF
C3, C4, C7, C14, C17, C18—1000 pF
C5, C6, C13, C15, C16—22 pF
C8—4.7 pF
C9—4700 pF
C10—.1μF
C11—47 pF
C12—33 pF
C19—220 pF
(Resistors are ¼ w carbon film.)
R1—100k Ω
R2—120k Ω
R3—470 Ω
R4, R7, R8, R12, R17—100 Ω
R5—820 Ω
R6, R10—22k Ω
R9—680 Ω
R11, R16—33k Ω
R13, R15—1k Ω
R14—4.7k Ω
(All coils are TOKO brand.)
L1, LS, L6—MC108, 7.5 turns
L2—272MT—1006A
L3—154FN6439
L4—KXNK3766
Q1, Q2—3SK88
Q3, Q4—BFW92 or 2N918 (Watch pinout)
X1—38.667 MHz HC18U crystal
D1—1N4148
Misc: 7 mm Coil Can, printed circuit board.

THE ROBOT 800 COPIES THOSE WEAK SIGNALS YOU USUALLY GIVE UP ON.

$100 FCC SSTV Ruling SPECIAL
CASH REBATE ON ROBOT 400s and 800s
$250 REBATE when both units purchased together
Expires May 31, 1982

Our built-in demodulator makes it possible.

The Robot 800's built-in demodulator equals or exceeds the performance of those found only in expensive stand-alone terminal units.

We designed the Robot 800 terminal specifically for the amateur radio operators' needs. Unlike many terminals that require costly external hardware and modifications, the Robot 800 used with a standard TV monitor provides you with all the features and capabilities you need for a complete system for amateur radio operation.

We consider our built-in demodulator the most important feature of our 800, since the first function of any terminal should be to receive as many signals as possible, even weak ones or those under heavy QRM.

The demodulator built into the Robot 800 equals or exceeds the performance found in expensive stand-alone terminals. This is because our demodulator employs separate two tone active discriminator filters for the demodulation of RTTY signal.

Most demodulators share a given filter for several different shifts to retune the filter to obtain continuous shift tuning capability. However, this results in a serious compromise in demodulator performance. But if you plan to use your terminal primarily for amateur radio operation, the only shifts you need are those used in amateur radio. I.e., 850 Hz wide shift or 170 Hz narrow shifts. By choosing the Robot 800 you will be getting a terminal with a demodulator that will provide you with unparalleled performance in receiving those weak signals that you usually would give up on.

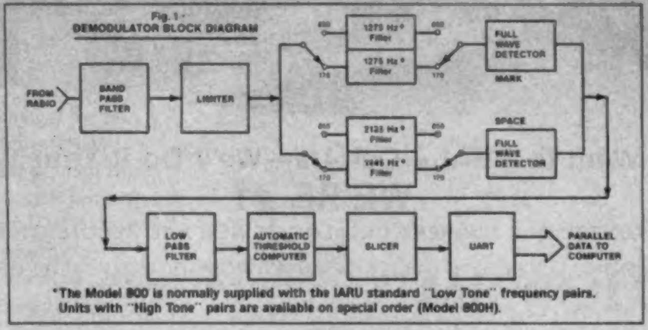
Other Robot 800 features include:

BAUDOT/ASCII Operation: ☐ Split screen operation ☐ Autostart ☐ Programmable WRU ☐ On screen status and turning indicator ☐ Current loop keyer for hard copy ☐ Programmable narrow shift I.D.

For Morse Code Operation: ☐ Morse autotrack ☐ Side tone oscillator ☐ Morse code trainer ☐ Speed Indicator

SSTV Operating Features: The Robot Model 800 allows alphanumeric characters to be typed on an SSTV format, displayed on a TV monitor and transmitted as a normal SSTV picture.*

Fig. 1 · DEMODULATOR BLOCK DIAGRAM



*The Model 800 is normally supplied with the IARU standard "Low Tone" frequency pairs. Units with "High Tone" pairs are available on special order (Model 800H).

For complete information on all the Robot 800's features, write for literature or visit your Robot dealer.

ROBOT

ROBOT RESEARCH INC.
7591 Convoy Court
San Diego, CA 92111 54
(714) 279-9430

* The Model 800 does not receive SSTV pictures. The Robot Model 400 is necessary for this.

World leaders in Slow Scan TV, Phone Line TV and Image Processing Systems

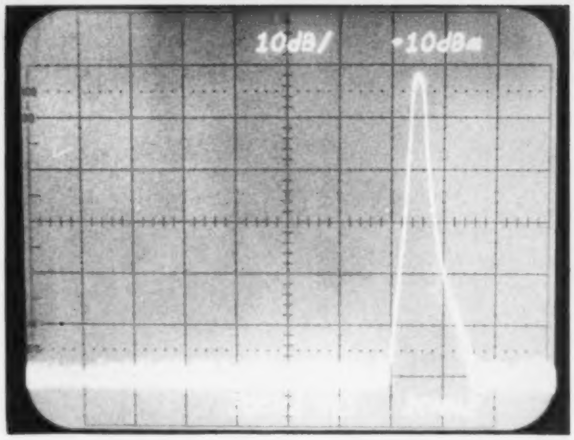


Photo E. Bandpass at mixer input (10 dB per vertical division, 10 MHz per horizontal division).

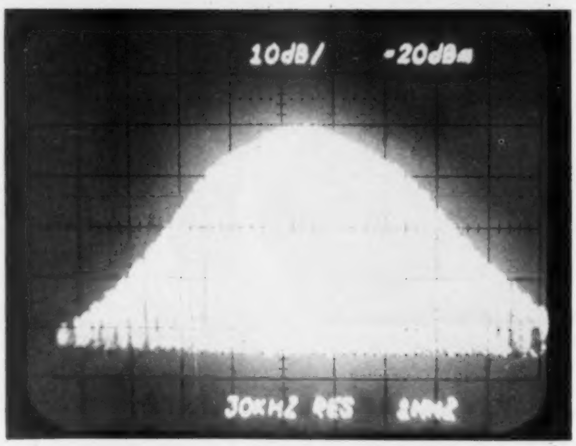


Photo F. The converter bandpass (2 dB per vertical division, 1 MHz per horizontal division).

some form of rf connector such as PL259 or BNC. If you do not already possess a standard of your own, then the BNC system is probably the best choice. Fitting a BNC connector to a cable is not the easiest task for the uninitiated, but it is worth persevering and acquiring the necessary skills, since the BNC system is probably the best general-purpose rf connector available.

The spectrum analyzer photographs were taken using Tektronix and Hewlett Packard test equipment. Because the input and output frequencies are not the same, it was not possible to use the conventional technique of sweeping a tracking generator with the spectrum analyzer. Instead, a Hewlett Packard 8640B signal generator was swept by hand over 130-160 MHz while the spectrum analyzer was tuned to a center frequency of 29 MHz. The resulting display was stored in the analyzer and photographed with a Polaroid camera. The results speak for themselves and, best of all, are entirely repeatable.■

ASSOCIATED RADIO **913-381-5900**
8012 CONSER BOX 4327
OVERLAND PARK, KANSAS 66204

BUY—SELL—TRADE
All Brands New & Reconditioned

Your BANKAMERICARD welcome here

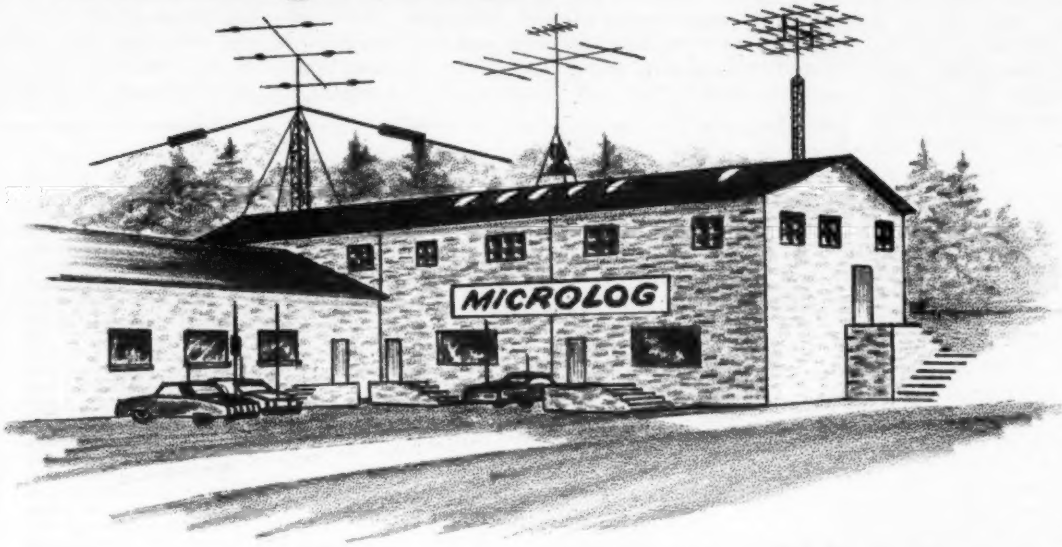
We Want to DEAL—Call Us—We'll Do It Your Way.
WE'RE #1

master charge THE INTERBANK CARD

NOTE: SEND $1.00 FOR OUR CURRENT CATALOG OF NEW AND RECONDITIONED EQUIPMENT.

★ALSO WE PERIODICALLY PUBLISH A LIST OF UNSERVICED EQUIPMENT AT GREAT SAVINGS.
A BONANZA FOR THE EXPERIENCED OPERATOR.
TO OBTAIN THE NEXT UNSERVICED BARGAIN LIST SEND A SELF ADDRESSED STAMPED ENVELOPE.

Our new RTTY headquarters



We've grown to meet the needs of Amateur and Commercial communications around the world.

COME SEE THE ATR-6800...

Now available with TELEX/Radio interface, data encryption (DES algorithm or Microlog's "CRYPTOLEX"), time diversity, full duplex, ARQ code operation, expanded memory (12K CMOS RAM or 128K "BUBBLE") for your commercial communications applications, plus automatic computer training program modules for Morse code, Triads etc.

THE ACT-1...

The Amateur's answer for an economical full feature CW/RTTY/SSTV system. Just listen for someone on the air complimenting his new RTTY station; it'll probably be another ACT-1 user! It's easy to hook up, easy to operate and easy on the pocketbook.

Get a live "ON-THE-AIR" demo of your favorite MICROLOG systems at our new engineering and manufacturing facility in Gaithersburg, Maryland, conveniently located near the Montgomery County Airpark. You can operate the N3JL station on HF, VHF or just tune around the bands. The new address for our manufacturing and demo station is 18713 Mooney Dr. (like the airplane), Gaithersburg, Maryland 20879.

For technical assistance call (301) 258-8400.

(301) 948-5307 is still the number for our executive and accounting offices. TELEX: 908778.

MICROLOG 51

INNOVATORS IN DIGITAL COMMUNICATION

See List of Advertisers on page 130

Compugrams Are Here

—BASIC message handling

William M. Kahn WA6ZZL
13450 Highway 8, Space 3
Lakeside CA 92040

When I first began handling formal message traffic, I was impressed with the professional "Western Union" look of the amateur radiogram forms published by the ARRL. Several months later, the romance ended as I reorganized desk drawers for the umpteenth time to make room for my ever-growing message file.* So, I began to design a program

Program listing.

```
1 REM * ARRL RADIOGRAM FORMAT *
2 REM * BY WILLIAM M KAHN, WA6ZZL *
3 REM * 13450 HIGHWAY 8 SPACE 3 *
4 REM * LAKESIDE  CA 92040 *
10 CLS:PRINT@20,"ARRL RADIOGRAM FORMAT"
20 PRINT@72,"THIS PROGRAM WILL RECORD AND STORE 10 MESSAGES"
30 FORX=1TO1500:NEXT:CLS
40 CLEAR3200:INPUT"SELECT (1) KEYBOARD OR (2) TAPE INPUT";Y:CLS:IFY=2THEN3000
70 M=0
80 FORM=M+1TO10:PRINT@0,M:INPUT"HEADING";H$
90 INPUT"TO";N$:IFA=2THEN190
100 INPUT"ADDRESS";A$:IFA-3THEN190
110 INPUT"LOCATION & ZIP";L$:IFA=4THEN190
120 INPUT"PHONE";P$:IFA=5THEN190
130 INPUT"CORRECTIONS: 0=NONE, 1=HEAD, 2=TO, 3=ADD, 4=LOC, 5=PHONE";A:IFA=0GOTO200
140 IFA=2THEN90
150 IFA=3THEN100
160 IFA=4THEN110
170 IFA=5THEN120
180 IFA=1INPUTC$
190 INPUT"MORE CORRECTIONS (1=YES, 0=NO)";A1:IFA1=1THEN130
200 INPUT"TEXT & SIGNATURE";T$:PRINTLEFT$(H$,6)
210 INPUT"RECEIVED FROM";R$
212 IFM=2THEN240
214 IFM=3THEN250
216 IFM=4THEN260
218 IFM=5THEN270
220 IFM=6THEN280
222 IFM=7THEN290
224 IFM=8THEN300
226 IFM=9THEN310
228 IFM=10THEN700
230 H1$=H$:N1$=N$:A1$=A$:L1$=L$:P1$=P$:C1$=C$:T1$=T$:R1$=R$:GOTO600
240 H2$=H$:N2$=N$:A2$=A$:L2$=L$:P2$=P$:C2$=C$:T2$=T$:R2$=R$:GOTO600
250 H3$=H$:N3$=N$:A3$=A$:L3$=L$:P3$=P$:C3$=C$:T3$=T$:R3$=R$:GOTO600
260 H4$=H$:N4$=N$:A4$=A$:L4$=L$:P4$=P$:C4$=C$:T4$=T$:R4$=R$:GOTO600
270 H5$=H$:N5$=N$:A5$=A$:L5$=L$:P5$=P$:C5$=C$:T5$=T$:R5$=R$:GOTO600
280 H6$=H$:N6$=N$:A6$=A$:L6$=L$:P6$=P$:C6$=C$:T6$=T$:R6$=R$:GOTO600
290 H7$=H$:N7$=N$:A7$=A$:L7$=L$:P7$=P$:C7$=C$:T7$=T$:R7$=R$:GOTO600
300 H8$=H$:N8$=N$:A8$=A$:L8$=L$:P8$=P$:C8$=C$:T8$=T$:R8$=R$:GOTO600
310 H9$=H$:N9$=N$:A9$=A$:L9$=L$:P9$=P$:C9$=C$:T9$=T$:R9$=R$
600 A=0:C$=" ":INPUT"PROCESS MORE TRAFFIC (1=YES, 0=NO)";P:CLS:IFP=0THEN700
610 NEXT M
700 GOSUB20000:IFM=10THEN1000
710 INPUT"ENTER MORE TRAFFIC THIS SERIES (1=YES, 0=NO)";P:CLS:IFP=1THEN610
1000 GOSUB30000
1010 INPUT"PROCESS MORE TRAFFIC (1=YES, 0=NO)";P:IFP=1THEN40ELSE9999
3000 PRINTTAB(10),"MESSAGE RETRIEVAL AND UPDATE SECTION":PRINT
3010 INPUT"PREPARE TAPE - PRESS ENTER WHEN READY";X:CLS:PRINT"LOADING"
4000 INPUT#-1,M
4010 INPUT#-1,H1$,C1$,N1$,A1$,L1$,P1$,P1$:INPUT#-1,T1$,S1$:IFM<2THEN4110
4020 INPUT#-1,H2$,C2$,N2$,A2$,L2$,P2$,P2$:INPUT#-1,T2$,S2$:IFM<3THEN4110
4030 INPUT#-1,H3$,C3$,N3$,A3$,L3$,P3$,R3$:INPUT#-1,T3$,S3$:IFM<4THEN4110
4040 INPUT#-1,H4$,C4$,N4$,A4$,L4$,P4$,R4$:INPUT#-1,T4$,S4$:IFM<5THEN4110
4050 INPUT#-1,H5$,C5$,N5$,A5$,L5$,P5$,R5$:INPUT#-1,T5$,S5$:IFM<6THEN4110
4060 INPUT#-1,H6$,C6$,N6$,A6$,L6$,P6$,R6$:INPUT#-1,T6$,S6$:IFM<7THEN4110
4070 INPUT#-1,H7$,C7$,N7$,A7$,L7$,P7$,R7$:INPUT#-1,T7$,S7$:IFM<8THEN4110
4080 INPUT#-1,H8$,C8$,N8$,A8$,L8$,P8$,R9$:INPUT#-1,T8$,S8$:IFM<9THEN4110
4090 INPUT#-1,H9$,C9$,N9$,A9$,L9$,P9$,R9$:INPUT#-1,T9$,S9$:IFM<10THEN4110
4100 INPUT#-1,H$,C$,N$,A$,L$,P$,R$:INPUT#-1,T$,S$
4110 INPUT#-1,E$:IFE$="END DATA"PRINTE$
4120 PRINT"THIS SERIES CONTAINS",M,"MESSAGES":GOSUB10000
4130 PRINTH1$,CHR$(10),TAB(5),R1$,S1$:IFM<2THEN4230
4140 PRINTH2$,CHR$(10),TAB(5),R2$,S2$:IFM<3THEN4230
4150 PRINTH3$,CHR$(10),TAB(5),R3$,S3$:IFM<4THEN4230
4160 PRINTH4$,CHR$(10),TAB(5),R4$,S4$:IFM<5THEN4230
4170 PRINTH5$,CHR$(10),TAB(5),R5$,S5$:IFM<6THEN4230
4180 PRINTH6$,CHR$(10),TAB(5),R6$,S6$:IFM<7THEN4230
4190 PRINTH7$,CHR$(10);TAB(5),R7$,S7$:IFM<8THEN4230
4195 GOSUB10000
4200 PRINTH8$,CHR$(10),TAB(5),R8$,S8$:IFM<9THEN4230
4210 PRINTH9$,CHR$(10),TAB(5),R9$,S9$:IFM<10THEN4230
4220 PRINTH$,CHR$(10),TAB(5),R$,S$
```

***FCC regulations (Section 97.105) require retention of third-party traffic for one year.**

which would allow me to copy traffic directly onto my micro keyboard and store all my third-party messages in a cassette data file.

The program is written in Radio Shack Level II BASIC for the TRS-80 microcomputer and occupies less than 6K of RAM. This includes 3.2K reserved for the string inputs but does not include any overhead for the BASIC interpreter (12K of ROM in the TRS-80). Users of other systems may have to adjust accordingly. As is, this program will handle up to ten messages in the ARRL radiogram format. If you have less available memory, just reduce this capacity to fit your own needs. Any micro with 4K of available RAM should store up to four messages quite nicely.

Operating the program is simple. You begin by making keyboard entries of up to ten messages. The inputs for each message are in the same sequence in which they are normally received off the air (lines 80-200). The transmitting station usually gives a "break" before sending the actual text, and line 130 provides an opportunity to correct any errors or missed copy up to that point. Following the "TEXT & SIGNATURE" input in line 200, enter the information required in the "RECEIVED FROM" section of the radiogram form. The second statement in line 200 recalls the message number and precedence in case the message heading has scrolled off the display screen. (It can be embarrassing to acknowledge receipt of a message when you have forgotten the number.) When you are finished entering traffic, each message entered is displayed in subroutine 20000 and the "STATUS" of each (corresponding to "SENT" on the ARRL form) is entered. You may then continue making entries or dump what you have into a data tape (subroutine 30000).

Note the branching arguments and string comparisons in lines 212-310. These allow repeated use of a single string set (H$, N$, etc.) for the inputs and assign the final string names when each message is complete. On the tenth run, there is no change of string names.

Once you have established a message data file on tape, you can make inputs from this file at the beginning of each run (lines 4010-4110). Lines 4120-4220 print the "HEADING," "RECEIVED FROM," and "STATUS" sections of each message for a quick review. You may then either load the next series from the tape or review each message and make additional keyboard entries. Note that if you wish to combine tape and keyboard inputs in the same run, you must make the tape input first. The

```
4230 PRINT:INPUT"EITHER (1) REVIEW MESSAGES OR (2) LOAD NEXT SERIES",X:IFX=2THEN3010
4240 GOSUB20000:IFM=10THEN4260
4250 INPUT"MAKE KEYBOARD ENTRIES (1=YES, 0=NO)",X:CLS:IFX=1THEN80
4260 INPUT"RECORD DATA TAPE (1=YES, 0=NO)";X:IFX=1GOSUB30000
4270 INPUT"PROCESS MORE TRAFFIC (1=YES, 0=NO)";X:IFX=1THEN40
4280 INPUT"IF ALL TRAFFIC FOR MONTH IS NOW TAPED, TYPE 1 ELSE TYPE 0";X:CLS:IFX=0THEN9999
4290 INPUT"THIS SECTION WILL RECORD THE END KEY DATA FOR YOUR MONTHLY
SUMMARY PROGRAM  PREPARE TAPE AND PRESS ENTER WHEN READY";X
4300 M=0:PRINT#-1,M:PRINT
4310 PRINT "THAT'S ALL - THANK YOU":PRINT
9999 PRINT"END SESSION":END
10000 INPUT"PRESS ENTER TO CONTINUE";X:CLS:RETURN
11000 INPUT"ENTER OR CHANGE STATUS (1=YES, 0=NO)";X:RETURN
20000 REM * MESSAGE PRINTOUT SUBROUTINE *
20005 CLS
20010 PRINTH1$;CHR$(10);C1$;CHR$(10);N1$;CHR$(10),A1$;CHR$(10);L1$;CHR$(10);P1$;CHR$(10);CHR$(10);T1$;CHR$(10),R1$,S1$
20020 GOSUB11000:IFX=0THEN20040
20030 INPUT"STATUS";S1$
20040 GOSUB10000:IFM<2THEN20410
20050 PRINTH2$;CHR$(10);C2$;CHR$(10),N2$,CHR$(10),A2$;CHR$(10);L2$;CHR$(10),P2$;CHR$(10),CHR$(10);T2$,CHR$(10);R2$,S2$
20060 GOSUB11000:IFX=0THEN20080
20070 INPUT"STATUS";S2$
20080 GOSUB10000:IFM<3THEN20410
20090 PRINTH3$;CHR$(10);C3$;CHR$(10);N3$;CHR$(10),A3$;CHR$(10);L3$;CHR$(10),P3$,CHR$(10);CHR$(10);T3$;CHR$(10);R3$,S3$
20100 GOSUB11000:IFX=0THEN20120
20110 INPUT"STATUS";S3$
20120 GOSUB10000:IFM<4THEN20410
20130 PRINTH4$;CHR$(10);C4$,CHR$(10);N4$;CHR$(10),A4$,CHR$(10);L4$;CHR$(10),P4$;CHR$(10),CHR$(10),T4$;CHR$(10);R4$,S4$
20140 GOSUB11000:IFX=0THEN20160
20150 INPUT"STATUS";S4$
20160 GOSUB10000:IFM<5THEN20410
20170 PRINTH5$;CHR$(10);C5$;CHR$(10);N5$;CHR$(10),A5$,CHR$(10);L5$;CHR$(10);P5$;CHR$(10);CHR$(10);T5$;CHR$(10);R5$,S5$
20180 GOSUB11000:IFX=0THEN20200
20190 INPUT"STATUS";S5$
20200 GOSUB10000:IFM<6THEN20410
20210 PRINTH6$;CHR$(10);C6$;CHR$(10);N6$;CHR$(10);A6$,CHR$(10);L6$,CHR$(10);P6$;CHR$(10),CHR$(10);T6$;CHR$(10);R6$,S6$
20220 GOSUB11000:IFX=0THEN20240
20230 INPUT"STATUS";S6$
20240 GOSUB10000:IFM<7THEN20410
20250 PRINTH7$;CHR$(10);C7$,CHR$(10);N7$;CHR$(10),A7$,CHR$(10);L7$;CHR$(10);P7$;CHR$(10);CHR$(10),T7$;CHR$(10),R7$,S7$
20260 GOSUB11000:IFX=0THEN20280
20270 INPUT"STATUS";S7$
20280 GOSUB10000:IFM<8THEN20410
20290 PRINTH8$;CHR$(10);C8$;CHR$(10);N8$;CHR$(10);A8$;CHR$(10);L8$;CHR$(10);P8$,CHR$(10);CHR$(10);T8$;CHR$(10);R8$,S8$
20300 GOSUB11000:IFX=0THEN20320
20310 INPUT"STATUS";S8$
20320 GOSUB10000:IFM<9THEN20410
20330 PRINTH9$;CHR$(10),C9$;CHR$(10),N9$;CHR$(10);A9$,CHR$(10);L9$;CHR$(10),P9$;CHR$(10);CHR$(10);T9$;CHR$(10);R9$,S9$
20340 GOSUB11000:IFX=0THEN20360
20350 INPUT"STATUS";S9$
20360 GOSUB10000:IFM<10THEN20410
20370 PRINTH$;CHR$(10);C$;CHR$(10);N$;CHR$(10),A$,CHR$(10);L$,CHR$(10),P$,CHR$(10);CHR$(10),T$;CHR$(10);R$,S$
20380 GOSUB11000:IFX=0THEN20400
20390 INPUT"STATUS";S$
20400 GOSUB10000
20410 INPUT"REVIEW MESSAGES AGAIN (1=YES, 0=NO)";X:IFX=1THEN20000
20420 RETURN
30000 REM * DATA DUMP SUBROUTINE *
30005 INPUT"PREPARE DATA TAPE - PRESS ENTER WHEN READY";X:CLS:PRINT"RECORDING"
30010 PRINT#-1,M
30020 PRINT#-1,H1$,C1$,N1$,A1$,L1$,P1$,R1$:PRINT#-1,T1$,S1$:IFM<2THEN30120
30030 PRINT#-1,H2$,C2$,N2$,A2$,L2$,P2$,R2$:PRINT#-1,T2$,S2$:IFM<3THEN30120
30040 PRINT#-1,H3$,C3$,N3$,A3$,L3$,P3$,R3$:PRINT#-1,T3$,S3$:IFM<4THEN30120
30050 PRINT#-1,H4$,C4$,N4$,A4$,L4$,P4$,R4$:PRINT#-1,T4$,S4$:IFM<5THEN30120
30060 PRINT#-1,H5$,C5$,N5$,A5$,L5$,P5$,R5$:PRINT#-1,T5$,S5$:IFM<6THEN30120
30070 PRINT#-1,H6$,C6$,N6$,A6$,L6$,P6$,P6$:PRINT#-1,T6$,S6$:IFM<7THEN30120
30080 PRINT#-1,H7$,C7$,N7$,A7$,L7$,P7$,R7$:PRINT#-1,T7$,S7$:IFM<8THEN30120
30090 PRINT#-1,H8$,C8$,N8$,A8$,L8$,P8$,R8$:PRINT#-1,T8$,S8$:IFM<9THEN30120
30100 PRINT#-1,H9$,C9$,N9$,A9$,L9$,P9$,R9$:PRINT#-1,T9$,S9$:IFM<10THEN30120
30110 PRINT#-1,H$,C$,N$,A$,L$,P$,R$:PRINT#-1,T$,S$
30120 PRINT#-1,"END DATA"
30130 PRINT"DATA DUMP COMPLETE":RETURN
```

number of messages available for keyboard input depends on the number loaded from the tape.

Since each "TEXT & SIGNATURE" input is a single string containing a maximum of 255 characters, some kind of line-length control is necessary in order to avoid breaking up words at the end of each line of text. Careful use of the space bar will accomplish this, but it consumes string space in the process. I prefer to use the "down-arrow" key on the TRS-80 keyboard. It performs a line feed/carriage return function without wasting memory and is excellent for separating the signature from the body of the text.

Notice the tape input and data dump sections (lines 4000-4110 and subroutine 30000). These functions are executed by the "INPUT#" and "PRINT#" statements. The phrase "−1" is required in Level II BASIC for multiple cassette deck control.

The series of "PRINT CHR$(10)" statements in subroutine 20000 execute the ASCII control code for "line feed/carriage return." The same result can be obtained by using separate PRINT statements for each string.

Finally, lines 4280-4310 are keyed to a separate but related program which automatically computes monthly traffic statistics from the data file. There is no effect on the resident program and the inputs are easily bypassed.

Whether you are presently handling a lot of traffic, a little traffic, or are now tempted to try traffic handling for the first time, I think you will find this program to be valuable and fun to work with.■

PLESSEY- AVANTEK

PLESSEY INTEGRATED CIRCUITS

SL1610 RF Amplifier	3.05	SL1623 AM Det/AGC Amp	6.11	SL1640 Double Bal Mod	4.07
SL1611 RF Amplifier	3.05	SL1624 Multimode Det	6.17	SL1641 Receiver Mixer	4.07
SL1612 AF Amplifier	3.05	SL1625 AM Det/AGC Amp	4.07	SL1680 Xtal Maint Ckt	5.45
SL1613 Limiting Amp	4.38	SL1626 VOGAD/Sidetone	3.72	SL6600 IF Amp/Det	6.78
SL1621 AGC Gen	4.07	SL1630 AF Amp	4.14	SL6640 FM Rcvr W/Amp	4.41
SL1622 AF AmpVOG	3.72	SL1631 AF Amp	4.07	SL6650 FM Rcvr W/O A	3.39

AVANTEK GPD SERIES AMPLIFIERS

(GPD 401.402,403) $25.00 EA.

12 - 14 dB Gain 5 500 MHZ.

CIRCUIT BOARDS FOR GPD 400 SERIES AMPS $2.00 ea.

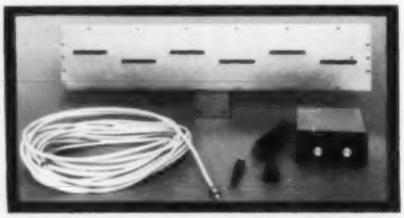
AMATEUR
MICROWAVE DOWNCONVERTER

COMPLETE - ASSEMBLED READY TO INSTALL NOT A KIT

SPECIAL $179.95

INCLUDING SHIPPING (U.P.S.)

VISA AND MASTERCARD ACCEPTED



50+ dB SYSTEM GAIN
TUNES 2.1 Ghz. to 2.4 Ghz.
PREAMPLIFIER 20+ dB GAIN ⩽2.5 dB NF
OUTPUT TUNES TV CHANNELS 2 TO 6

OUTPUT IMPEDANCE 75 OR 300 OHMS
FULL YEAR WARRANTY
PERFORMANCE GUARANTEED OR YOUR MONEY REFUNDED

CALL (804) 489-2156 ✓447

ELECTRONIC HOBBY INNOVATIONS

7510 GRANBY STREET SUITE 207 NORFOLK, VIRGINIA 23505

ege, inc.

LOOK FOR US AT DAYTON!

ORDER TOLL FREE

APRIL VALUES

1-800-336-4799

ORDER HOURS: 11 am - 8 pm M-F
9 am - 4 pm Saturday

Bonus: 2% Discount for Prepaid Orders
(Cashier's Check or Money Order)

VISA

Closed Tuesdays

TEN-TEC SPECIALS

515 Argonaut HF XCVR	399.95
525 Argosy HF XCVR	469.00
580 Delta HF XCVR	748.95
546 Omni-C HF XCVR	1040.00

TEN-TEC Accessories
in stock at discount prices

MFJ PRODUCTS (Call for other MFJ items)

989 New 3KW Tuner	287.75
962 1.5KW Tuner mtr/switch	199.95
949B 300 watt deluxe tuner	122.00
941C 300 watt tuner switch/mtr	78.42
940 300 watt tuner switch/mtr	69.70
484 Grandmaster memory keyer 12 msg	121.72
482 4 msg Memory keyer	87.96
422 Pacesetter Keyer w/Bencher BY1	87.15
408 Deluxe Keyer with speed mtr	69.69
496 Keyboard II	296.95
752B Dual **turnable** filter	78.42
102 24-hour clock	30.95

DAIWA/MCM

CN 520/CN 540 Watt Meters	59.95/69.95
CNW418/CNW518 Antenna Tuners	169.95/279.95
CNA 2002 Auto 2.5W Tuner	399.95

ASTRON POWER SUPPLIES (13.8 VDC)

RS7A 5 amps continuous, 7 amp ICS	48.60
RS12A 9 amps continuous, 12 amps ICS	66.35
RS20A 16 amps continuous, 20 amps ICS	87.20
RS20M same as RS20A + meters	105.50
RS35A 25 amps continuous, 35 amp ICS	131.95
RS35M same as RS35A + meters	151.95
VS35M 25 amp continuous adjustable	171.00
VS20M 16 amp continuous adjustable	124.00
MINIQUAD HQ-1	129.95

VoCOM ANTENNAS/2m Amps

5/8 wave 2m hand held Ant	19.95
2 watts in, 25 watts out 2m Amp	69.95
200 mw in, 25 watts out 2m Amp	82.95
2 watts in, 50 watts out 2m Amp	105.95
MIRAGE AMPS & WATT METERS	CALL

MPI /MP2 Watt Meters
2m Amps B23, B1016, B108, B3016
UHF Amp D1010N

BENCHER PADDLES Black/Chrome	35.25/42.95
BUTTERNUT *NEW!* HF6V 10-80m Vertical	99.95

SUPER SPECIALS

AEA Isopole Ant., Keyers, Code Readers	CALL

ANTENNA/ROTOR SPECIALS

Alliance HD73	89.95
CDE Ham IV	163.95

When purchased with Cushcraft, HyGain, KLM or Hustler Triband Beam

AZDEN PCS 300 handheld, 2m	CALL
PCS 3000 2m XCVR	284.00
SANTEC H71200 2m handheld	269.00
S7-7/7 440-450 handheld	259.95
***NEW* SANTEC** 2m & 440 MHz handhelds	Call for Quotes
KDK FM 2025A 25 watt FM XCVR	269.95

BIG DISCOUNTS

KENWOOD, ICOM, YAESU, AZDEN, KDK, DENTRON
— Call for our quote —

HY-GAIN ANTENNAS.........CALL FOR QUOTES
***NEW!* TH7DX Triband Beam NOW IN STOCK!**
Upgrade kits for TH6DXX to TH7DX. Most antennas now with stainless hardware.

CUSHCRAFT (other antennas in stock)

A4 New Triband Beam 10-15-20m	204.00
A3 New Triband Beam 10-15-20m	164.00
AV3 New 10-15-20m Vertical	41.50
ARX 2B New Ringo Ranger 2m	33.95
A32-19 2m "Boomer" DX Beam	75.95
220B 220 MHz "Boomer"	68.95
214B Jr. Boomer 144-146 MHz	61.95
214FB Jr. Boomer 144.5-148 MHz	61.95
A147-11 11-Element 2m	34.50

TELEX HEADSETS-HEADPHONES

C1210/C1320 Headphones	22.95/32.95
PROCOM 200 Headset/dual Imp. MIC	77.50
PROCOM 300 lt/wt Headset/dual Imp. mic.	69.95
CABLE RG8/U Foam 95% Shield	26¢/ft.
8 wire Rotor 2 #18, 6 #22	18¢/ft.

KLM ANTENNAS (other antennas in stock)

KT34A 4-Element Triband Beam	320.75
KT34XA 6-Element Triband Beam	469.50
144-148 13LB 2m 13-Element with balun	77.95
144-148 16C 2m 16-Element for oscar	93.55
420-450 14 420-450 MHz 14-element beam	37.54
420-450 18C 420-450 MHz 18-element oscar	58.70
432 16LB 16 elem. 430-434 MHz beam/balun	60.70
HUSTLER 5BTV 10-80m Vertical	92.50
4BTV 10-40m Vertical	73.95
3TBA New 10-15-20m Beam	188.95

HF Mobile Resonators	**Standard**	**Super**
10 and 15 meter	7.95	12.50
20 meters	10.95	14.95
40 meters	12.50	17.30
75 meters	13.50	27.95
Avanti AP 151.3G 2m on glass ant.		27.95

ORDER INFORMATION

Orders:	1-800-336-4799
Information and Virginia orders:	(703) 643-1063
Store Hours: ✓453	M-W-F: 12 noon-8 pm Thursday: 10 am-4 pm Saturday: 9 am-3 pm

Mailing Address: 2410 Drexel St.
Woodbridge, VA 22192

Store Location: 14415 Jefferson Davis Hwy.
Woodbridge, VA 22191

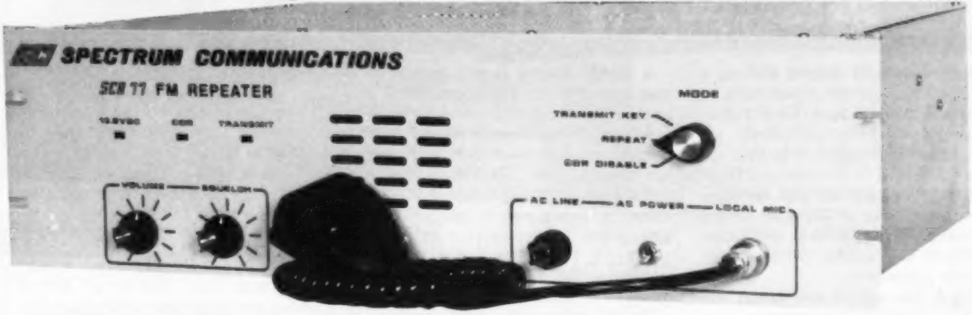
— CALL FOR QUOTES —

Send stamp for a flyer. Terms: Prices do not include shipping. VISA and Master Charge accepted. 2% discount for prepaid orders (cashier's check or money order). COD fee $2.00 per order. Prices subject to change without notice or obligation.

new — In Repeaters

Some people want the finest, Others want the lowest price.... Now you can have Both!

Introducing the *New Low Cost* Spectrum SCR 77 Repeaters—*2M, 220 & 440 MHz!*



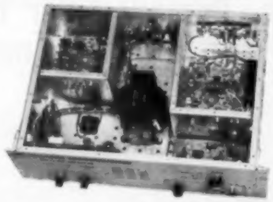
15 or 30 Wt. Xmtrs.

Includes: **● 0.35μV Rcvr. 8 Pole IF Filter**
- **Crystals** – high stability .0005%
- **Local Mic**
- **Your Call programmed into IDer**
- **Provision for Auto-Switchover to Btry. Pwr.**
- **Built-in 115/230V AC Supply;** basic **Panel Controls, Spkr., LED Indicators**

If you're looking for a new Repeater, but you really don't need (or can't afford) all the features and options on our world famous, 'super deluxe' SCR1000/4000, then our new economy line of SCR77 Repeaters is ideal for you!

These new Repeaters maintain the quality of design, components and construction which made Spectrum gear famous. However, all of the "bells & whistles" which you may not need or want have been eliminated—*at a large cost savings to you!* The SCR77 is a real "workhorse" basic machine designed for those who want excellent, super-reliable performance year after year – *but no frills!* ('PL', 12 Pole IF Filter, Front End Preselector, and a 30Wt. Transmitter are the only "built-in" options available; but Autopatch, Remote Control, and other equipment can be connected via the rear panel jack.)

A complete line of duplexers, antennas, cabinets, cable, etc., is also available.



Of course, if you do want a full featured/super deluxe repeater, with higher power and a full list of available 'built-in' options, then you want our SCR1000 or 4000 "Dream Machine". These units will continue to be available for those who want 'The Ultimate in Repeaters'.

SCR77 Pricing (15Wt.): 2M or 220MHz, $995.00 Amateur Net. 440MHz, $1150.00. For no 'plug-in' ID board (Export), deduct $40.00. *Call or write today for a data sheet, or to place your order!* Sold Factory Direct or through Export Sales Reps only.

10M FM RX/TX Boards, Repeaters & Remote Bases NOW IN PRODUCTION! Call or Write for Full Info.

¡Se habla Espanol!

SC ~68

SPECTRUM COMMUNICATIONS

1055 W. Germantown Pk, S4 • Norristown, PA 19401 • (215) 631-1710

~See List of Advertisers on page 130

47

MFJ *DELUXE* Versa Tuner II

$139.95 buys you one of the world's finest 300 watt antenna tuners with features that only MFJ offers, like . . . dummy load, SWR, forward, reflected watt meter, antenna switch, balun. Matches everything from 1.8 thru 30 MHz: coax, random wires, balanced lines.

TRANSMITTER MATCHING
FUNCTION
ANTENNA SEL.
MFJ
SWR SEN.
INDUCTOR
ANTENNA MATCHING
MFJ DELUXE VERSA TUNER II
MODEL MFJ-949B

MFJ's Best Versa Tuner II . . . Built-in SWR/Wattmeter, dummy load, antenna switch.

$139⁹⁵

This is MFJ's best Versa Tuner II. And one of the world's finest 300 watt (RF output) tuners.

The MFJ-949B *Deluxe* Versa Tuner II gives you a combination of quality, performance, and features that others can't touch at this price . . . or any price.

PERFORMANCE: You can run your full transceiver power output — up to 300 watts RF output — and match your transmitter to any feedline from 1.8 thru 30 MHz whether you have coax, balanced line or random wire.

FEATURES: A 200 watt 50 ohm dummy load lets you tune up for maximum performance.

A sensitive meter lets you read SWR with only 5 watts and both forward and reflected power in two ranges (300 and 30 watts).

A flexible antenna switch lets you select 2 coax lines direct or thru tuner, random wire or balanced line and dummy load.

A large efficient airwound inductor 3 inches in diameter gives you plenty of matching range and less losses for more watts out.

1:4 balun. 1000 volt capacitors. SO-239 coax connectors. Binding post for balanced line, random wire, ground. All aluminum cabinet. 10x3x7 ins.

QUALITY: Every single unit is tested for performance and inspected for quality. Solid American construction, quality components.

The MFJ-949B carries a full one year unconditional guarantee.

Order from MFJ and try it — no obligation. If not delighted, return it within 30 days for a refund (less shipping).

To order, simply call us toll free 800-647-1800 and charge it on your VISA or Master Charge or mail us a check or money order for $139.95 plus $4.00 for shipping/handling.

Don't wait any longer to tune out that SWR and enjoy solid QSO's. Order your ***Deluxe*** Versa Tuner II today. Call MFJ or see your dealer.

CALL TOLL FREE . . . 800-647-1800

Call 601-323-5869 for technical information, order/repair status. Also call 601-323-5869 outside continental USA and in Mississippi.

MFJ ENTERPRISES, INCORPORATED
Box 494, Mississippi State, MS 39762

47

MFJ Dual Tunable SSB/CW Filter

lets you zero in SSB/CW signal and notch out interfering signal at the same time. Primary Filter has tunable peak, notch, lowpass, highpass. Auxiliary Filter has peak, notch. Noise limiters for SSB, CW.

Adjust primary filter for optimum readability. Use auxiliary filter to eliminate interference.

AUXILIARY
FREQUENCY
SELECTIVITY
MFJ
PRIMARY
SELECTIVITY
FREQUENCY
NOTCH
PEAK BYPASS AUX
MFJ SIGNAL ENHANCER II
DUAL TUNABLE SSB/CW FILTER
MODEL MFJ-752B

$89⁹⁵

The MFJ-752B Signal Enhancer dual tunable active filter system gives you signal processing performance and flexibility that others can't match.

For example, select optimum Primary Filter mode for SSB signal, zero in with frequency control and adjust bandwidth for best response. Then with the Auxiliary Filter notch out an interfering heterodyne . . . or peak the desired signal.

For CW, peak both Primary and Auxiliary Filters for narrow bandwidth to give skirt selectivity that others can't touch. Or use Auxiliary Filter to notch out a nearby QSO.

The Primary Filter lets you peak, notch, lowpass, or highpass signals with double tuned filter for extra steep skirts. The **Auxiliary Filter** lets you notch a signal to 70 db. Or peak one with a bandwidth down to 40 Hz.

Tune both Primary and Auxiliary Filters from 300 to 3000 Hz. Vary the bandwidth from 40 Hz to almost flat. Notch depth to 70 db.

MFJ has solved problems that plague other tunable filters to give you a constant output as bandwidth is varied. And a linear frequency control. And a more effective notch filter.

Works with any rig. Plugs into phone jack. 2 watts for speaker. Inputs for 2 rigs. LED for power.

Switchable noise limiter for impulse noise; trough clipper removes background noise.

Simulated stereo feature for CW lets ears and brain reject QRM. Yet hear off frequency calls.

Speaker and phone jacks. Speaker is disabled by phones. OFF bypass filter. 10x2x6 ins. 9-18 VDC or 110 VAC with optional AC adapter, $7.95.

Every single unit is tested for performance and inspected for quality. Solid American construction.

Order from MFJ and try it — no obligation. If not delighted, return it within 30 days for refund (less shipping). One year unconditional guarantee.

Order today. Call toll free 800-647-1800. Charge VISA, MC or mail check, money order for $89.95 plus $4.00 shipping/handling for MFJ-752B.

Don't wait any longer to tune out interfering signals, order now. Call MFJ or see dealer.

CALL TOLL FREE . . . 800-647-1800

Call 601-323-5869 for technical information, order/repair status. Also call 601-323-5869 outside continental USA and in Mississippi.

MFJ ENTERPRISES, INCORPORATED
Box 494, Mississippi State, MS 39762

MFJ Super Keyboards

MFJ
SPEED
TONE
WEIGHT
VOLUME

5 MODES: *CW, Baudot, ASCII, memory keyer, Morse code practice.* **TWO MODELS: *MFJ-496, $339.95.*** *256 character buffer, 256 character message memory, automatic messages, serial numbering, repeat/delay.* ***MFJ-494, $279.95.*** *50 character buffer, 30 character memory, automatic messages.*

MFJ brings you a pair of 5 Mode Super Keyboards that gives you more features per dollar than any other keyboard available. You can send CW, Baudot, ASCII. Use it as a memory keyer and for MORSE code practice.

You get text buffer, programmable and automatic message memories, error deletion, buffer preload, buffer hold, plus much more.

MODE 1: CW

The 256 character (50 for 494) **text buffer** makes sending perfect CW effortless even if you "hunt and peck."

You can preload a message into the buffer and transmit when ready. For break-in, you can stop the buffer, send comments on key paddles and then resume sending the buffer content.

Delete errors by backspacing.

A meter gives buffer remaining or speed. Two characters before buffer full the meter lights up red and the sidetone changes pitch.

Four programmable message memories (2 for 494) give a total of 256 characters (30 for 494). Each message starts after one ends for no wasted memory. Delete errors by backspacing.

To use the **automatic messages,** type your call into message A. Then by pressing the CQ button you send CQ CQ DE (message A).

The other automatic messages work the same way: CQ TEST DE, DE, QRZ.

Special keys for KN, SK, BT, AS, AA and AR.

A lot of thought has gone into human engineering these MFJ Super Keyboards.

For example, you press only a one or two key sequence to execute any command.

All controls and keys are positioned logically and labeled clearly for instant recognition.

Pots are used for speed, volume, tone, and weight because they are more human oriented than keystroke sequences and they remember your settings when power is off.

Weight control makes your signal distinctive to penetrate QRM.

MODE 2 & 3 (RTTY): BAUDOT & ASCII

5 level Baudot is transmitted at 60 WPM. Both RTTY and CW ID are provided.

Carriage return, line feed, and "LTRS" are sent automatically on the first space after 63 characters on a line. This gives unbroken words at the receiving end and frees you from sending the carriage return. After 70 characters the function is initiated without a space.

All up and down shift is done automatically. A downshift occurs on every space to quickly clear garbled reception.

The buffer, programmable and automatic messages, backspace delete and PTT control (keys your rig) are included.

The ASCII mode includes all the features of Baudot. Transmission speed is 110 baud. Both upper and lower case are generated.

MODE 4: MEMORY KEYER

Plug in a paddle to use it as a deluxe full feature memory keyer with automatic and programmable memories, iambic operation, dot-dash memories, and all the features of the CW mode.

MODE 5: MORSE CODE PRACTICE

There are two Morse code practice modes. Mode 1: random length groups of random characters. Mode 2: pseudo random 5 character groups in 8 separate repeatable lists (with answers).

Insert space between characters and groups to form high speed characters at slower speed for easy character recognition.

Select alphabetic or alphanumeric plus punctuation. You can even pause and then resume.

MORE FEATURES

Automatic incrementing serial number from 0 to 999 can be inserted into buffer or message memory for contests.

Repeat function allows repetition of any message memory with 1 to 99 seconds delay. Lets you call CQ and repeat until answered.

Two key lockout operation prevents lost characters during typing speed bursts.

Clock option (496 only) send time in CW, Baudot, ASCII. 24 hour format.

Set CW sending speed before or while sending.

Tune switch with LED keys transmitter for tuning. Tune key provides continuous dots to save finals. Built-in sidetone and speaker.

PTT (push-to-talk) output keys transmitter for Baudot and ASCII modes.

Reliable solid state keying for CW: grid block, cathode, solid state transmitters (-300V, 10 ma Max, +300V, 100 ma Max). TTL and open collector outputs for RTTY and ASCII.

Fully shielded. RF proof. All aluminum cabinet. Black bottom, eggshell white top. 12"Dx7"Wx1¼"H (front) x3½"H (back). Red LED indicates on.

9-12 VDC or 110 VAC with optional adapter.

MFJ-494 is like MFJ-496 less sequencial numbering, repeat/delay functions. Has 50 character buffer, 30 character message memory. Clock option not available for MFJ-494.

Every single unit is tested for performance and inspected for quality. Solid American construction.

OPTIONS

MFJ-53 AFSK PLUG-IN MODULE. 170 and 850 Hz shift. Output plugs into mic or phone patch jack for FSK with SSB rigs and AFSK with FM or AM rigs. $39.95 (+$3).

MFJ-54 LOOP KEYING PLUG-IN MODULE. 300V, 60 ma loop keying circuit drives your RTTY printer. Opto-isolated. TTL input for your computer to drive your printer. $29.95 (+$3).

MFJ-61 CLOCK MODULE (MFJ-496 only). Press key to send time in CW, Baudot or ASCII. 24 hour format. $29.95 (+$3).

110 VAC ADAPTER. $7.95 (+$3).

BENCHER IAMBIC PADDLE. $42.95 (+$4).

A PERSONAL TEST

Give the MFJ-496 or MFJ-494 Super Keyboard a personal test right in your own ham shack.

Order one from MFJ and try it — no obligation. See how easy it is to operate and how much more enjoyable CW and RTTY can be. If not delighted, return it within 30 days for refund (less shipping). One year unconditional guarantee.

To order, call toll free 800-647-1800. Charge VISA, MC, or mail check or money order for **$339.95** for MFJ-496, **$279.95** for MFJ-494, **$39.95** for MFJ-53 AFSK module, **$29.95** for MFJ-54 Loop Keying module, **$29.95** for MFJ-61 Clock module, **$7.95** for the 110 VAC adapter and **$42.95** for Bencher Paddle. Include $5.00 shipping and handling per order or as indicated in parentheses if items are ordered separately.

Why not really enjoy CW and RTTY? Order your MFJ Super Keyboard at no obligation today.

TO ORDER OR FOR YOUR NEAREST DEALER
CALL TOLL FREE 800-647-1800

Call 601-323-5869 for technical information, order/repair status. Also call 601-323-5869 outside continental USA and in Mississippi.

✓47

Write for FREE catalog, over 80 products

MFJ ENTERPRISES, INCORPORATED
Box 494, Mississippi State, MS 39762

✓See List of Advertisers on page 130

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place.

FLEMINGTON NJ
APR 3

The annual Flemington NJ Hamfest will be held on Saturday, April 3, 1982, from 8:30 am to 3:30 pm at the Hunterdon Central High School Field House, Flemington NJ, located between New York City and Philadelphia at the intersection of Rtes. 202 and 31, just 10 miles south of I-78. Admission is a $3.00 donation. There will be a flea market with a large heated indoor area, 200 tables, major manufacturers, and more. Talk-in on 146.52, 147.015, 224.12, and 224.54. For reservations or further information, call (201)-788-4080, or write Cherryville Repeater Association, c/o W2FCW, Box 76, Farview Drive, Annandale NJ 08801.

MEMPHIS TN
APR 3

The Memphis Mini-Fest will be held on Saturday, April 3, 1982, from 8:00 a.m. to 5:00 p.m. at the Pipkin Building in the Mid South Fairgrounds. Admission is $1.00. Flea market space is $5.00 or 2 spaces for $8.00 (bring your own tables and chairs; none will be furnished). Doors will be open at 6:00 am for unloading. There will be a hospitality party Saturday night at 7:30 p.m. For further details, contact Clayton Elam K4FZJ, President, Mid South Amateur Radio Association, 28 N. Cooper Street, Memphis TN 38104, or phone (901)-274-4418 (days) or (901)-473-6714 (nights).

ROCHESTER MN
APR 3

The Rochester Amateur Radio Club and the Rochester Repeater Society will sponsor the Rochester Area Hamfest on Saturday, April 3, 1982, at John Adams Junior High School, 1525 NW 31 Street, Rochester MN. Doors will open at 8:30 a.m. There will be a large indoor flea market for radio and electronic items, prize raffles, refreshments, and plenty of free parking. Talk-in on 146.22/.88 (WR0AFT). For further information, contact RARC, c/o WB0YEE, 2253 Nordic Ct. NW, Rochester MN 55901.

OAK RIDGE TN
APR 3-4

The Oak Ridge ARC will hold the fourth annual Oak Ridge Hamfest on April 3-4, 1982, at the Civic Center, Oak Ridge TN, from 9:00 am to 5:00 pm. Admission is $3.00 and accompanied children will be admitted free. There will be an indoor dealer display, forums, prizes, concessions, and an outdoor flea market. Talk-in on 146.28/.88, 147.72/.12 (backup), and 146.52. For more information, send an SASE to ORARC Hamfest, Attn: Jim McNair N4EXG, PO Box 291, Oak Ridge TN 37830.

MADISON WI
APR 4

The Madison Area Repeater Association, Inc. (MARA), will hold its tenth annual Madison Swapfest on Sunday, April 4, 1982, at the Dane County Exposition Center Forum Building, Madison WI. Doors will open at 8:00 am for sellers and exhibitors and at 9:00 am for the public. Admission is $2.50 per person in advance and $3.00 at the door. Children twelve and under will be admitted free. Tables are $4.00 each in advance (early reservations are recommended) and $5.00 at the door. Features will include a flea market, commercial exhibitors, and door prizes, as well as an all-you-can-eat pancake breakfast and a bar-b-q lunch. There are hotel accommodations nearby and plenty of parking space. Talk-in on 146.16/.76 WR9ABT. For reservations or more information, write to MARA, PO Box 3403, Madison WI 53704.

GROSSE POINTE MI
APR 4

The Southeastern Michigan Amateur Radio Association (SEMARA) will hold its 24th annual hamfest swap and shop on April 4, 1982, from 8:00 am to 3:00 pm at the Grosse Pointe North High School, Vernier Road (between Mack and Lakeshore), Grosse Pointe MI. The admission charge is $1.00 in advance and $2.00 at the door. There will be good food, plenty of free parking, door prizes, cash prizes, and a grand prize drawing. Talk-in on 147.75/.15. For further information, please send an SASE to SEMARA Swap, PO Box 646, St. Clair Shores MI 48083, or phone Ray Ninness WD8KXN at (313)-777-0119.

FRAMINGHAM MA
APR 4

The Framingham Amateur Radio Association will hold its 6th annual spring flea market on Sunday, April 4, 1982, at the Framingham Police Station drill shed, Framingham MA. Admission is $2.00. Sellers' tables are $8.00 before March 27, and $10.00 after that date. Doors will open at 10:00 am but sellers may begin setting up at 8:30 am. Radio equipment, computer gear, food, and bargains will be available. Talk-in on .75/.15 and .52. For more information, contact Ron Egalka K1YHM, 3 Driscoll Drive, Framingham MA 01701, or phone (617)-877-4520.

SOMERSWORTH NH
APR 17

The Great Bay Radio Association will hold its 2nd annual Hamfest-Flea Market on Saturday, April 17, 1982, from 9:00 am to 3:00 pm at the Somersworth

NEMAL ELECTRONICS

COAXIAL CABLE SALE

This Month's Specials

Same Day Shipping

RG8U Mil spec 96% shield......$22.95/100 Ft.
Rotor Cable 8-cond. 2-18 ga., 6-22 ga. ......$14.95/100 Ft.
100 ft. RG8U with PL-259 on each end$19.95
BELDEN Coax in 100 ft. rolls
RG58U #9201......$11.95
RG8U #9208......$24.95
Grounding strap, heavy duty tabular braid
3/16 in. tinned copper......10¢/ft.
3/8 in. tinned copper......30¢/ft.

POLYETHYLENE DIELECTRIC
RG8X 95% shield (black, white or gray).....$13.95/100 ft.
RG213 noncontaminating 95% shield mil spec...36¢/ft.
RG174/U mil spec. 96% shield......08¢/ft.
RG11U 96% shield, 75-ohm mil spec......25¢/ft.
RG8U 96% shield, mil spec......31¢/ft.
RG6A/U double shield, 75-ohm......25¢/ft.
RG55A (RG223) double silver shield, 50-ohm......85¢/ft.
RG58 mil spec. 96% shield......11¢/ft.

LOW LOSS FOAM DIELECTRIC
RG8U 80% shield......18¢/ft.
RG58U 80% shield......07¢/ft.
RG58U 95% shield......10¢/ft.
RG59U 100% foil shield, TV type......07¢/ft.
RG8U 97% shield 11 ga. (equiv. Belden 8214)......31¢/ft.

CONNECTORS MADE IN USA
Amphenol Pl-259......79¢
PL-259 push-on adapter shell......10/$3.89
PL-259 & SO-239......10/$5.89
Double Male Connector......$1.79
PL-258 Double Female Connector......98¢
1 ft. patch cord w/RCA type plugs each end.....3/$1.00
Reducer UG-175 or 176......10/$1.99
UG-255 (PL-259 to BNC)......$3.50
Elbow (M359)......$1.79
F59A (TV type)......10/$2.15
UG 21D/U Amphenol Type N Male for RG8......$3.00
BNC UG88C/U, male......$1.25
3/16 inch Mike Plug for Collins etc......$1.25

Connectors—shipping 10% add'l, $1.50 minimum

FREE CATALOG

Cable—shipping $3.00 1st 100 ft., $2.00 each add'l 100 ft.

COD add $1.50—FLA. Res. add 4% Sales Tax

5685 SW 80th. Street Dept. RLO Miami, Fl. 33143 Call (305) 661-5534

412

Come See Us At The Dayton Hamvention

step up to the best...

Without doubt LR-1 is the repeater value leader! Compare its outstanding performance with any repeater -- then look at its price. LR-1 features include individual die-cast shielding of receiver and transmitter plus a separately shielded 6-stage receiver prefilter for peak performance in harsh RF environments • Front panel metering of all vital functions • CW identifier • Symmetric hard limiting for clean natural audio • Low power MOS control logic • Even the cabinet is included -- just plug in and go! The price? Only $1095 (US amateur club net).

NEW

LR-1
REPEATER AMPLIFIER
MICRO CONTROL SPECIALTIES
PA-75

LINKING? The LR-1 is also available with control circuitry for Link Transceiver operation. Now link repeater sites with the flexible control capability you've always wanted.

HIGH POWER? Our PA-75 power amplifier is the champion! Ruggedly built to give years of dependable operation in continuous duty repeater service.

NEW

MARK 3-C CONTROLLER
MICRO CONTROL SPECIALTIES
POWER
RESET
STATUS INDICATORS
MARK 3-CR REPEATER

Mark 3C repeaters and controllers have no equal in performance. Both units feature auto patch, reverse autopatch, autodial, 13 Morse messages and a total of 39 functions. Both feature microprocessor control and both have been proven in the field from icy Alaska to tropical Brazil. A Mark 3C supercontroller can make any repeater a super performer. The Mark 3CR repeater is in a class by itself. It combines superbly designed RF circuitry in one handsome package. It is without doubt the world's most advanced repeater!

• SEE US AT DAYTON •

CALL OR WRITE FOR FULL DETAILS

MICRO CONTROL SPECIALTIES

23 Elm Park • Groveland, Massachusetts 01834 • Telephone (617) 372-3442

Armory, Somersworth NH. The entrance fee is $1.00 per person and the ticket counts toward door prizes. There will be antique radios and computers on display, hourly door prizes, and a grand raffle for a Radio Shack color computer as well as other prizes. Free parking. Food and refreshments will available. For advance reservations and further information, call Dick Sedgewick N1EX at (603)-742-3703, or write Great Bay Radio Association, Rte. 16, Dover NH 03820.

SCHERERVILLE IN
APR 17

The Lake County Amateur Radio Club will hold its 29th annual Herb S. Brier Memorial Banquet on April 17, 1982, at The Ember's Steak House, 1112 Route 41, Schererville IN. Tickets are $8.50 and can be obtained by writing to PO Box 1909, Gary IN 46409. No tickets will be sold at the door.

WELLESLEY MA
APR 17

The Wellesley Amateur Radio Society will conduct its annual auction on Saturday, April 17, 1982, at the Wellesley High School cafeteria, Rice Street, Wellesley MA. Doors open at 10:00 am. Talk-in on .63/.03, .04/.64, and .52. For further information, contact Kevin P. Kelly WA1YHV, 7 Lawnwood Place, Charlestown MA 02129.

GRAND JUNCTION CO
APR 17

The Grand Mesa Repeater Society will hold the third annual Western Slope Swapfest on Saturday, April 17, 1982, from 10:00 am to 4:00 pm at the Plumbers and Steamfitters Union Hall, 2384 Highways 6 and 50, Grand Junction CO. Admission is free and swap tables are $5.00. Features will include an auction, door prizes, and refreshments. Talk-in on .22/.82. For further information, send an SASE to Dale Ellis KD0M, 588 Starlight Street, Grand Junction CO 81501, or call (303)-434-5981.

JACKSON MS
APR 17-18

The Jackson Amateur Radio Club will host the ARRL Mississippi State Convention on April 17-18, 1982, at the Raymond Road National Guard Armory, Jackson MS. Admission is free. Hours are noon to 5:00 pm on Saturday and 8:00 am to 2:00 pm on Sunday. Activities include forums, net and special activity group meetings, dealer exhibits, prizes, and flea market. Swap tables are $5.00 each day. Special rates are available at the Holiday Inn Southwest if you specify that you are attending the Jackson hamfest. There will be a hospitality room at the hotel Saturday night and food will be available at the hamfest both days. Talk-in on 146.16/.76, 146.52, and 3987.5. For swap-table reservations or further information, contact Don Elder KC5VD, 2806 N. Mill Street, Jackson MS 39216, or phone (601)-362-0336.

TRENTON NJ
APR 17-18

The 7th Trenton Computer Festival will be held on Saturday and Sunday, April 17-18, 1982, from 10:00 am to 5:00 pm at Trenton State College, Trenton NJ. Admission for all activities is $5.00. Student admission is $3.00. Features will include commercial exhibits, an electronics flea market, many technical sessions, and, on Sunday, free short courses. For further information write TCF-82, Trenton State College, Hillwood Lakes CN550, Trenton NJ 08625, or call (609)-771-2487.

CUSTOM PRINTED CIRCUIT DESIGN

CIRCUIT LAYOUTS

TAPE MASTERS

NEGATIVES

PC BOARDS

QUOTES ON REQUEST

CUSTOM CIRCUIT DESIGN

✓120 DAVE STOFT, WD6DXX

11120 E 46TH AVE, SPOKANE, WA 99206 509•922•7852

PADUCAH KY
APR 18

The Paducah Amateur Radio Association Ham/Swap Fest will be held on April 18, 1982, from 9:00 am to 3:00 pm CST at the Paducah Jaycee Civic Center, Paducah KY. Admission is $1.00 and includes a free table. There will be net meetings and a flea market. Talk-in on 147.66/.06. For more information, contact Bruce Huyck WD4BVW, Rte. 8, Box 431, Paducah KY 42001, or phone (502)-444-7725.

SULLIVAN IL
APR 18

The 21st annual Moultrie Amateur Radio Klub Hamfest will be held on April 18, 1982, at the Moultrie County 4-H Center Fairgrounds, Caldwell Road, located 5 miles east of Sullivan IL. There will be a heated indoor flea market and a large, covered, outdoor flea market. There is no charge to vendors and space is on a first come, first served basis. Talk-in on 146.94 and 146.655/.055. For more information, write Ralph Zancha N9CDK, President, MARK, PO Box 55, Lovington IL 61937, or call (217)-873-5287.

RALEIGH NC
APR 18

The Raleigh Amateur Radio Society will hold its 10th annual hamfest on Sunday, April 18, 1982, from 8:00 am to 4:00 pm at the Crabtree Valley Shopping Center parking area, Raleigh NC. Admission is $4.00; there will be a table charge for exhibitors and flea market displays. First prize is a choice of a Kenwood TS-830S transceiver or an Icom IC-251A multi-mode 2m transceiver with a Mirage B108 80-Watt amplifier. A hospitality room and party will be held the preceding evening from 7:00 pm to 10:00 pm. Talk-in on 146.04/146.64 and 146.28/146.88 both days. For more information, please contact Ken Boggs KB4RV, 8704 Cliff Top Ct., Raleigh NC 27612, or phone (919)-782-8646.

DAYTON OH
APR 23

The 13th annual B•A•S•H will be held on Friday night, April 23, 1982, at the Dayton Hamvention at the Convention Center, Main and Fifth Streets, Dayton OH. Admission is free and parking is available in adjacent city garage. Live entertainment, sandwiches, snacks, and a COD bar will be available. Awards will include a new synthesized HT and a synthesized pocket scanner. For further information, contact the Miami Valley FM Association, PO Box 263, Dayton OH 45401.

SPOKANE WA
APR 24

The Inland Empire Amateur Clubs will hold the third annual Inland Empire Swap Fest on April 24, 1982, beginning at 9:00 am at the Spokane Interstate Fairgrounds, Broadway and Havana, Spokane WA. Admission is $1.00 and includes a special door prize raffle ticket. Regular raffle tickets are $.50. Activities include commercial and non-commercial displays, an auction, YL craft sales, a snack bar, a banquet at Roy's Chuckwagon, and a flea market. Tables (4' x 8') are $5.00 per full table and exhibit space is free. Talk-in on 146.34/.94 and 146.52. For reservations for tables, exhibit space, and/or a free RV site (without electrical hookup), write Swap Fest, c/o Jan Thiemann KA7DDV, 78033 E. Mission, Spokane WA 99206.

BEMIDJI MN
APR 24

The Bemidji Amateur Radio Club will hold a swapfest on Saturday, April 24, 1982, starting at 9:00 am at the Holiday Inn, Highway 2 west, Bemidji MN. There will be door prizes, refreshments, and plenty of free parking. For more information, contact Bill Williams WA0ABX, Rte. 1, Box 369J-3, Bemidji MN 56601, or phone (218)-751-9070.

DIXON IL
APR 25

The Rock River Amateur Radio Club will hold the 16th annual hamfest on Sunday, April 25, 1982, at the Lee County 4-H Club Center, 1 mile east of the junction of Rtes. 52 and 30, south of Dixon IL. Advance tickets are a $2.00 donation; at the gate a $2.50 donation will be asked. Breakfast will be served from 6:30 am to 9:00 am and lunch will be served from 9:00 am on. The grand prize is $500

ATV

FAST SCAN

$399

Have you tried it yet?
ATV TRANSMITTER/CONVERTER

TC—1

- *10 Watts Output
- *Standard Frequencies Available
- *Broadcast Standard Sound
- *High-resolution & color video
- *Regulated AC Supply Built In
- *Tuneable Downconverter & Preamp

Connect to the antenna terminals of any TV set, add a good 450 MHz antenna, a camera and there you are...Show the shack, home movies, computer games, video tapes, etc.

ATV DOWNCONVERTER

For those who want to see the ATV action before they commit to a complete station, the TVC-4 is for you. Great for public service setups, demos, and getting a buddy interested. Just add an antenna and a TV set tuned to CH. 2, 3, or 4 and plug in to 117 volts a.c. **$89.00**

TVC-4

TVC-4L extra low-noise version...$105 delivered in USA

HOMEBREWERS: ASK FOR OUR BASIC FOUR-MODULE PACKAGE

CALL OR WRITE FOR OUR COMPLETE LIST OF SPECIFICATIONS, station setup diagrams, and optional accessories which include antennas, modulators, detectors, test generators, cameras, etc. WE ARE A FULL-LINE SUPPLIER OF ALL YOUR ATV NEEDS.

TERMS: VISA or MASTER CARD by telephone or mail, or check or money order by mail. All prices are delivered in USA. Allow three weeks after order for delivery.

P.C. ELECTRONICS
Tom W6ORG Maryann WB6YSS
(213) 447-4565
2522 Paxson Lane,
Arcadia, California 91006

FOR A SMALL MIRACLE, CALL 1-800-654-8850.

Our small miracle is simply this: call Sentry's TOLL FREE number, and we'll deliver the finest quality crystals on time—from five working days to two weeks, plus our 48-hour Emergency Service.*

The miracle grows larger when you examine Sentry's quality workmanship. Each crystal is made of flawless materials and hand crafted with state-of-the-art technology to exceed MIL-Spec standards.

And when you consider that Sentry is still a small, dependable company out-performing the big ones, our small miracle takes on giant proportions. Fact is, most other companies can't work our miracles, big or small.

Sentry
Crystal Park, Chickasha, Oklahoma 73018

✓333

*Please allow extra time for precision, UHF and special frequencies.

Lacue Likes You... and you'll like Lacue

WIRE AND CABLE

RG-213	27¢/ft
RG-8/U foam, 95% shield	23.5¢/ft
RG-8X foam, 95% shield	11¢/ft
RG-58C/U mil spec	11¢/ft
RG-59 mil spec	9¢/ft
RG-11	19¢/ft
450 ohm ladder line 100 ft roll	$10.25
8 Conductor Rotor Cable	15¢/ft
14 Ga. Stranded Copper (50 ft. multiples)	7¢/ft
12 Ga. Solid Copperweld (50 ft. multiples)	7¢/ft
14 Ga. Solid Copperweld (50 ft. multiples)	5¢/ft
8 Ga. Solid Aluminum (50 ft. multiples)	6¢/ft

ANTENNA ACCESSORIES

Ceramic Insulators		45¢ ea
Amphenol PL-259		75¢ ea
Van Gorden	Balun	$7.50
	Center Insul	$4.60
W2AU Balun 4:1 or 1:1		$13.25
B&W Traps 40 thru 10		$25.65 per pair
B&W Traps 80 thru 10		$25.65 per pair
B&W 375 or 376 coax switch		$19.25
B&W 593 coax switch		$17.95
B&W 595 coax switch		$22.50

ROTORS

CDE TAILTWISTER	$238.25
CDE HAM 4	$170.30
CDE CD 45	$ 92.55
CDE AR 22	$ 51.45

1982 CALLBOOKS

U.S. version	$14.95
DX version	$14.05

ANTENNAS

Mini Products	Mini Quad	$127.95
Mini Products	C4 Vertical	$ 55.00
Butternut	HF6V	$104.00
Butternut	2MCV	$ 27.50
Hustler & Hy Gain		call or write for big discount price

Prices subject to change without notice.
Hours: Mon.—Sat. 10AM—6PM; Tues. & Fri. 'til 9PM
Telephone: (814) 536-5500

LACUE COMMUNICATIONS ELECTRONICS
102 Village Street
Johnstown, PA 15902

✓4

MorseMatic

NEW MORSEMATIC™ MM-2 KEYER

THE MORSEMATIC KEYER BY AEA HAS BEEN PROCLAIMED *BEST* OF ALL PADDLE KEYERS ON THE MARKET

NEW ... $139.95

Now you can get all the features of the world's first and still best microcomputerized keyer at a 30% reduction in price. The new model MM-2 has all the outstanding features of the MM-1 predecessor such as dual microcomputers with copywritten software, 500 character soft-partitioned™ memory with editing, exclusive beacon mode, exclusive automatic speed increase trainer mode, and exclusive automatic serial number generator. In addition, the MM-2 comes complete with CMOS memory and provisions for internal memory keep alive battery. The MM-2 operates from external 12 VDC at approximately 350 Ma.

ACCESSORIES:

Model AC-1 600 Ma 12 VDC Wall Adaptor	$14.95
Model ME-2 Memory Expansion (2000 Total Morse Characters)	$39.95

If you have hesitated buying the best because of price, you need to wait no longer, the best is now available in an improved form at a price you can afford.

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

call or visit:

Radios Unlimited
1760 Easton Avenue
Somerset, N.J. 08873
(201) 469-4599

✓105

AEA
Brings you the Breakthrough!

cash and the second prize is $200 cash. You need not be present to win these, but you must be present to win the hourly door prizes. Talk-in on 146.52. For advance tickets, write Ed Webb WD9CJB, 618 Orchard, Dixon IL 61021.

BRAINTREE MA
APR 25

The South Shore Amateur Radio Club of Braintree MA will hold an indoor flea market on Sunday, April 25, 1982, at the Viking Club, 410 Quincy Avenue, Braintree MA from 11:00 am to 4:00 pm. An entrance fee of $1.00 will include one chance for the door prizes. Additional chances are 3 for $1.00. Plenty of parking will be available. The Viking Club will be open for vendors at 10:00 am. Eight-foot tables will be available for $8.00 each and may be reserved in advance by sending a check payable to the South Shore Amateur Radio Club to Ed Doherty W1MPT, 236 Wildwood Avenue, Braintree MA 02184. For further information, call Ed at (617)-843-0510 or (617)-843-4431 (evenings).

LYNNFIELD MA
MAY 1

The Quannapowitt Radio Association (QRA) will hold an indoor/outdoor hamfest on Saturday, May 1, 1982, from 9:00 am to 4:00 pm at South Hall Fire Station, corner of Salem and Summer Streets, Lynnfield MA. Admission is $1.00 at the door. Reserved tables are $5.00; at the hamfest, $7.00. Food will be available. Talk-in on 146.19/.79 or .52. For additional details, write Dave Meldrum KA1M1, 28 Cedar Lane, North Andover MA 01845.

HAM HELP

Our club is in dire need of a service manual for a Johnson Thunderbolt linear amplifier, catalog # 240-353.

Ronald Daly WB0ZNI
Hot Springs
Amateur Radio Club
Box 385
Hot Springs SD 57747

I need schematics for the 2-meter Edgecomm mobile radios 25A and 3000A. I will pay copy costs and postage.

Rudolph Fallang KA7DTA
717B SE 6th
College Place WA 99324

I am looking for a DG-5 digital display and a DS-1A dc-dc converter for a Kenwood TS-520S. Please state condition and price, including shipping.

John P. Iorio WD4MWH
5228 Longview Dr.
New Port Richey FL 33552

I am looking for a Vocaline AT-30 420-MHz transceiver. These units are very old, but I am sure that one can be found.

Allen Harris
3047 Worden St.
Muskegon MI 49441

I am in need of a source for stainless spring rod in pieces that are five feet long and no more than 1/8" in diameter. Tapered replacement CB whips are not quite long enough.

Stan Hockman KA4DSK
638 Flager Blvd.
Lake Park FL 33403

Does anyone have issues of "Ham News," published by G.E. for at least six years (1948-1954) or "Ham Tips" published by RCA in the early 1950s? I will copy your originals or pay for duplication.

I am also in need of a Knight T-60 transmitter and a Star Roamer R-55 receiver in any condition.

John C. White WB6BLV
560 North Indiana
Porterville CA 93257

An amateur in the Ivory Coast is looking for a RTTY program and interface to use with the Atari 800 computer. Can anyone help me to help him?

Fred Trick, Sr. KB9UB
Zetfred Company
PO Box 265
North Manchester IN 46962

Wanted: Robot Model 70 SSTV monitor, regardless of condition.

Dante Ventriere KA4JRE
17831 NW 81 Ave.
Hialeah FL 33015

Wanted: amateur radio QSL cards prior to 1930 for old-time display.

Dave Noon VE3IAE
19 Honeysuckle Cr.
London, Ontario
Canada N5Y 4P3

I need a schematic and operating manual for a Knight KG-2100 dc oscilloscope.

Joe Bische KA4HAG
3412 29th St. W.
Bradenton FL 33505

I am looking for a 5AHP7A CRT or the address of a dealer that carries them.

Wayne Robotham
40 Thyra Ave.
Toronto M4G 5G5
Ontario, Canada

I need a system to connect my home with a telephone approximately two miles away. Does anyone know of wireless units that will cover that range?

Alfonso Gallegos
Casilla #3150
Quito, Ecuador

I would like to hear from anyone who has modified an Alda 103 transceiver. I am particularly interested in adding a digital readout and 10 meters.

J. L. Navarrete WB6MHN
1903 Santa Ysabela
Rowland Heights CA 91748

Purple Heart, a national amateur radio chapter and net of combat wounded veterans, is being formed to affiliate with the Military Order of the Purple Heart, Inc. Eligible veterans are invited to write for information and application.

Clem Harris KC5MM
6110 Pecan Trail Dr.
San Antonio TX 78249
(512)-699-1420

I need complete information on how to make a frequency converter in order to have an SB620 Scanalyzer set at an input of 455 kHz show a display from a Drake TR4CW's 9-MHz i-f.

In order to prevent possible overload, could a very small sample be taken from the i-f and put through an amplifier before coupling to the SB620?

Albertis G. Long KC9JY
620 N. 3rd
Boonville IN 47601

I am trying to complete construction of the add-on capacitance meter described in the February, 1981, issue of *73*. I would appreciate hearing from anyone who has had success with this project.

Tom Reel WB8UDQ
5071 Tahquamenon
Flushing MI 48433

I would like to get a complete history for the Hammarlund HQ-200 receiver. I am looking for the years it was made, modifications, and any specialized service manual as opposed to the regular operational manual. I will pay for copying and postage or copy and return your original.

D'arcy Brownrigg
Chelsea, Quebec
Canada J0X 1N0

I am returning home from Germany to the Rome/Cartersville, Georgia, area. Any job information for a First Class Radiotelephone and amateur Extra class licensee commencing in August would be most appreciated.

B. G. Echols, Jr.
WA2NYR/DA2EJ
University of Maryland
Jaeger Kas., Bldg. 26
APO New York NY 09162

I would like to get a Novice license. Are there any nearby hams that could help me on my days off? An hour every other weekend would be a great help.

Robert Good
Box 86
Overbrook KS 66524
(913)-665-7483

I need a service manual and schematic diagram for a Motorola T41GGV series "Twin V" transceiver. I will pay reasonable copying costs or copy and return.

Jeffrey Miller WD4SMA
2112 Natahoa Court
Falls Church VA 22043

I am looking for manuals and specification sheets for Hallicrafters SX101 and SX42 receivers. I will buy your originals or pay for copying.

Bob Allie
736 Pine St.
Central Falls RI 02863

ICOM

You pay LESS at AES...just Call TOLL FREE 1-800-558-0411 - ask for our DISCOUNT DESK

SAVE $200

IC-720A Digital HF Transceiver. 9 HF Ham bands, receives .1 to 30 Mhz. 100w output, cont. LED readout, 2 VFO's, AM, CW, SSB & RTTY filters. PBT, RIT, VOX, semi break-in, blanker & processor. 13.5v/20A 4½"h × 9⅝"w × 12½"d, 17 lbs. (Reg. $1349)... **NOW $1149.00**

FL-32 500Hz CW filter	59.50
FL-34 5.2 KHz AM filter	49.50

Accessories for 720/730

PS-15 Power supply (Reg. $149)	**NOW $134.95**
PS-20 20A power supply (Reg. $229)	**NOW** 199.95
Adaptor cable - PS-20 to 720/730	10.00
CF-1 Cooling fan - PS-15/20	45.00
EX-144 Adaptor for CF-1 on PS-15	6.50
MMB Mobile mount	19.50
Phone patch - specify radio (Reg. 139)	**NOW** 129.95
SP-3 Base station speaker	49.50
SM-5 Electret desk microphone	39.00
AH1 Mobile ant./tuner (Reg. $289)	**NOW** 259.95
AT-100 100w auto. tuner (Reg. $349)	**NOW** 314.95
AT-500 500w auto. tuner (Reg. $449)	**NOW** 399.95

IC-2KL 160-15m (WARC) solid-state linear. 500 watts outout. With AC supply (Reg. $1795) .. **NOW $1395.00**

IC-22U 800 ch., 144-147.995 MHz, 1/10 watts, thumbwheel frequency selection. 6⅛"w × 2⅛"w × 8½"d, 3¾ lbs. Mic., mt. & cord. (Reg. $299)...... **NOW $269.95**

EX-199 Remote frequency selector	35.00

IC-290A All Mode 2m mobile, 143.8-148.199 Mhz, 1/10w. RIT, prog. offsets, 5 mem., 2 VFOs, 2 scan sys., SSB sq., priority ch., sidetone, blanker, T/T mic. 6¾"w × 2½"h × 8⅝"d (Reg. $549) ..... **NOW $479.95**

IC-490A *(New!)* All mode 432 MHz mobile. 430-439.995 MHz, 10w, scan mic. (March) .... **TBA**

IC-25A Compact, 25w 2 meter rig. 5 memories 2 VFOs, priority channel, 2 scanning systems, automatic scan resume, provision for memory backup. With T/T mic. 2"h × 5½"w × 7"d. (Reg. $349)........... **NOW $309.95**

SAVE $129

IC-730 Solid-state 80-10m (WARC) HF Transceiver. 200w PEP input. 2 VFOs, 8 freq. memory. IF shift with PBT optional. UP/DN tuning with optional mic. 9½"w × 3¾"h × 10⅞"d, 10 lbs. (Reg. $829) ...... **NOW $699.95**

FL-30 SSB filter (passband tuning)	59.50
FL-44 455 KHz SSB filter (Reg. $159)	**NOW** 144.95
FL-45 500 Hz CW filter	59.50
EX-195 Marker unit	39.00
EX-202 LDA interface; 730/2KL/AH-1	27.50
EX-203 150 Hz CW audio filter	39.00
EX-205 Transverter switching unit	29.00
HM-10 Scanning microphone	39.50

IC-251A Microprocessor controlled 2 meter All-mode Transceiver for 143.8-148.1999 Mhz. 7 digit display. 10 watts, 3 memories, mem. scan & programmable band scan. 600 KHz offsets, variable splits with two built-in VFO's, 13.8vdc or 117vac. w/ampl. hand mic. 4½"h × 9¾"w × 10½"d, 11 lbs (Reg. $749)...... **NOW $599.95**

IC-451A UHF All Mode Transceiver for OSCAR mode B or J & simplex. For 430-440 or 440-450 MHz. Features similar to the IC-251A (Reg. $899)....... **NOW $769.95**

IC-AG1 UHF Preamplifier (Reg. $89)	**NOW** $79.95

IC-551 All mode 6m transceiver for 50-53.999 MHz. 6 digit display, 10 watts, 3 memory channels w/variable scan, 2 VFO's & blanker. 13.8vdc & 117vac 4½"h × 9¾"w × 10½"d, 14 lbs (Reg. $479)...... **NOW $399.95**

EX-106 FM adaptor (Reg. $125)	**NOW** 112.95
EX-107 VOX unit (Reg. $55)	**NOW** 49.95
EX-108 PB tune/RF proc. (Reg. $105)	**NOW** 94.95

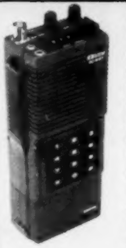
IC-551D same as 551 but 80 watts. EX-107 & EX-108 built-in. 13.8vdc @ 18A (Reg. $699).... **NOW** 599.95

PS-20 AC power supply (Reg. $229)	**NOW** 199.95
CF-1 Cooling fan for PS-20	45.00
EX-106 FM adaptor (Reg. $125)	**NOW** 112.95

IC-560 6 meter SSB, FM & CW Mobile Transceiver. LED readout, 10 watts, 3 memories, memory scan & prog. band scan. 600 KHz offsets, 2 VFOs. 13.8 VDC @ 3.5A. Microphone & mount. (Reg. $489) ..... **NOW $439.95**

MasterCard VISA

SAVE $30



IC-2AT Synthesized 2m FM Hand-held with built-in T/T pad. 800 channels in 5 KHz steps 144-147.995 selected by thumb wheels & +5 KHz upshift switch; ± 600 KHz offsets. With BP-3 250 ma. nicad pack output is .15 LOW or 1.5w HIGH. Optional packs for larger capacity or higher power. Supplied with 250 ma. nicad pack, wall charger, flexible antenna, belt clip, strap, earphone and plugs. **Model IC-2A** does not have built-in T/T pad. 6.6"h × 2.6"w × 1.4"d, 1 lb.

	Regular	SPECIAL!
IC-2AT HT w/TTP, nicad & chgr	$269.50	$239.50
IC-2A 2m HT w/nicad & wall chgr	$239.50	214.50
ML-1 2.3/10w 2m mobile linear	89.00	79.95
IC-3AT 220 HT/TTP, nicad & chgr	299.95	269.95
IC-3A 220 HT/nicad & charger	269.95	249.95
IC-4AT 440 HT/TTP, nicad & chgr	299.95	269.95
IC-4A 440 HT/nicad & charger	269.95	249.95

BC-25U Extra wall charger	12.50
BC-30 Drop-in charger for BP-2,3 & 5	69.00
BP-2* 450 ma, 7.2v nicad pk, 1W output	39.50
BP-3 Extra 250 ma nicad pk, 1.5W output	29.50
BP-4 Alkaline battery case	12.50
BP-5* 450 ma, 10.8v nicad pk, 2.3W output	49.50
CP-1 Cig lighter plug & cord (BP-3)	9.50
DC-1 DC operation module	17.50
HM-9 Speaker/microphone	34.50
Leather case (specify radio)	34.95
FA-2 Flexible antenna for 2A, 2AT (BNC)	10.00
3A-TTN TT pad for 2A, 3A, 4A	39.50

*BC-30 required to charge BP-2 & BP-5

IC-202S 2 meter portable SSB Transceiver. 3W PEP output. Uses regular "C" cells, optional Nicad pack & charger or IC-3PS AC supply/speaker. With hand mic. whip antenna and strap (Reg. $279)..... **NOW $249.95**

IC-20L 2m, 10w ampl. (Reg $98)	**NOW** 89.95

IC-402 432 Mhz portable SSB Transceiver. Features same as IC-202S above (Reg. $389)..... **NOW $349.95**

IC-30L 10w, 432 amp. (Reg. $105)	**NOW** 94.95
IC-502A 6m SSB port. (Reg. $239)	**NOW** 214.95
IC-3PE 3A ps/speaker (Reg $95)	**NOW** 89.95
IC-3PS ps/spkr - ports. (Reg $95)	**NOW** 89.95
SP4 Remote speaker for portables	24.95

Accessories:

HM-3 Deluxe mobile microphone	$17.50
HM-5 3 or 4 pin Noise canx microphone	34.50
HM-7 8-pin amplified hand microphone	29.00
HM-8 8-pin T/T microphone	49.50
HM-10 Scanning microphone (IC-720)	39.50
SM-2 4-pin electret desk microphone	39.00
SM-5 8- pin electret desk microphone	39.00
HP-1 Headphones	34.50

New AES Branch Store: Clearwater, FL
1898 Drew St. • Phone (813) 461-4267

E-X-P-A-N-D-E-D WATS PHONE HOURS

Our Milwaukee Headquarters will answer the Nationwide WATS line **1-800-558-0411** until 8 pm (Milwaukee time) Monday thru Thursday

HOURS: Mon , Tue, Wed & Fri 9-5:30; Thurs 9-8; Sat 9-3
(Las Vegas & Clearwater stores not open Thursday evenings)

Call Toll Free: 1-800-558-0411

In Wisconsin (outside Milwaukee Metro Area)
1-800-242-5195

AMATEUR ELECTRONIC SUPPLY® Inc.

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 - Phone (414) 442-4200

AES BRANCH STORES

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
Ohio Wats 1-800-362-0290
Outside Ohio 1-800-321-3594

ORLANDO Florida 32803
621 Commonwealth Ave.
Phone (305) 894-3238
Fla. Wats 1-800-432-9424
Outside Fla. 1-800-327-1917

LAS VEGAS, Nevada 89106
1072 N. Rancho Drive
Phone (702) 647-3114
Pete, WA8PZA & Squeak, AD7K
Outside Nev. 1-800-634-6227

ASSOCIATE STORE

ERICKSON COMMUNICATIONS
CHICAGO, Illinois 60630
5456 N. Milwaukee Avenue
Phone (312) 631-5181
Outside ILL. 1-800-621-5802

TUFTS ELECTRONICS

61 Lowell Rd., Hudson, N.H. 03051
9-6 Daily (603) 883-5005 12-5 Sunday

LOWER and LOWER prices ! Thats what our catalog is bringing you this month. There have been numerous price reductions throughout. Our goal is to bring you the BEST PRODUCTS at the lowest possible prices. Our large inventory and the money saved by using such tiny print are two of the reasons we can do this. Another is our new highly efficient MAIL ORDER HEADQUARTERS in HUDSON,NH. Most orders are shipped the same day they are received !Located just 30 minutes from Rte 128 in BOSTON via RTE 3 and only 45 minutes from LOGAN AIRPORT we're convenient to all of New England. You don't have to be a Yankee to save money either, our phone service is second to none. NO SALES TAX in New Hampshire is another way we save you money ! Tufts is OPEN SEVEN DAYS A WEEK, our showroom hours are 9-6 Daily and 12-5 on Sunday. For the many who have asked a LARGE TYPE CATALOG is now available for $1.

DISCOUNTS - FREE CATALOG - EXPORTS - PACKAGES

ALLIANCE MFG

[illegible]

ANTECK ANTENNAS

[illegible]

ASTRON CORP

[illegible]

B&W LOADS AND WATTMETERS

[illegible]

B&W COAX SWITCHES

		REGULAR	SALE
375	SIX POSITION AUTO/GROUND UNUSED POS	22.50	22.50
376	5 POSITION SIXTH POS GROUNDS ALL POS	22.50	22.50
377	110 VAC ANT CHANGEOVER RELAY	25.00	25.50
590	5 POSITION NON GROUNDING	22.95	22.50
590G	5 POS AUTO-GROUND UNUSED POS	22.95	22.50
593	3 POS WITH AUTO-GROUND UNUSED POS	19.95	19.50
594	2 POLE 2 POSITION	22.00	22.50
595	6 POS WITH AUTO-GROUND ALL UNUSED POS	24.95	24.50

BROAD BAND FOLDED DIPOLE

BARKER & WILLIAMSON'S MODEL 370-15 B&W

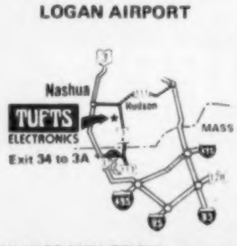
B & W's Broad Band Folded Dipole covers all amateur bands including the new 12, 17, and 30 meter bands. Also covers CAP frequencies, MARS, Military, in any frequency from 3.5-30 MHz. Being used throughout the world. Total length only 90 feet long, spreader spacing 19 inches. SWR less than 2:1 from 3.5-30 MHz. Rugged construction for long life. Can be installed as a flat top, inverted 'V' or sloper. Also available for 2-22 MHz. Power handling capacity 2 kW. Supplied completely assembled with RG-8 type cable with SO-239 connector. Terminated with PL-259 connector on each end. Patent Pending.

Price $149.50

COAX CABLES

[illegible]

ONLY 45 MIN FROM LOGAN AIRPORT



ONLY 30 MIN FROM BOSTON AREA **BOSTON**

HUSTLER

[illegible]

DAIWA

[illegible]

HITACHI OSCILLOSCOPES

[illegible]

BIRD

Power Range	Frequency Bands (MHz) 2-30	25-60	100-250	200-500	400-1000
5 watts	—	5A	5C	5D	5E
10 watts	—	10A	10C	10D	10E
25 watts	—	25A	25C	25D	25E
50 watts	50H	50A	50C	50D	50E
100 watts	100H	100A	100C	100D	100E
250 watts	250H	250A	250C	250D	250E
500 watts	500H	500A	500C	500D	500E
1000 watts	1000H	1000A	1000C	1000D	1000E
2500 watts	2500H				
5000 watts	5000H				

BIRD ELECTRONICS

[illegible]

CORNELL-DUBILIER ROTORS

[illegible]

COBRA CB

[illegible]

BEARCAT

		REGULAR	SALE
BC-300	7 BAND 50 CHANNEL INCLUDES AIRCRAFT	399.95	299.50
BC-350	7 BAND 50 CHANNEL INCLUDES AIRCRAFT	389.95	279.50
BC-210XL	6 BAND 18 CHANNEL W/SEARCH & HOLD	349.95	229.50
BC-100	HANDHELD 8 BAND 16 CHANNEL SYNTHESIZED	449.00	329.50

BENCHER

		REGULAR	SALE
BY-1	IAMBIC PADDLE HEAVY BLACK BASE		42.50
BY-2	DELUXE IAMBIC KEY HEAVY CHROME BASE		52.50
ZA-1A	BALUN 3.5-30 MHZ		17.50
ZA-2A	BALUN 14-30 MHZ WITH HDW FOR 2" BOOM		21.50
RZ-2	AUDIO CW FILTER		69.50
AP-1	ACCESSORY POWER SUPPLY 12VDC		9.50

cushcraft CORPORATION

CUSHCRAFT 50/220/430 ANTENNAS

[illegible]

CUSHCRAFT HF ANTENNAS

[illegible]

CUSHCRAFT 2 METER ANTENNAS

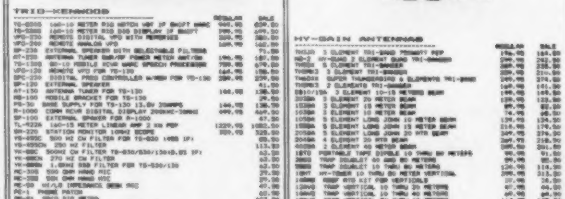
[illegible]

ICOM

ICOM

[illegible]

(Send $1.00 for our enlarged catalog)



KENWOOD

TRIO-KENWOOD

[illegible]

KENWOOD VHF

[illegible]

FLUKE DMM'S

[illegible]

(US MODEL 15-160MTRS)

Drake L-7

2kW Linear Amplifier

10m-160m coverage. 2kW PEP, 1kW CW, RTTY, SSTV operation – all modes, full rated input, continuous duty cycle. Accurate built-in rf wattmeter, with forward/reverse readings, is switch selected. By-pass switching for straight through, low power operation without having to turn off amplifier. Bandpass tuned input circuitry for low distortion and 50 Ohm input impedance.

DRAKE

DRAKE TVI FILTERS

[illegible]

RL DRAKE TVRO

[illegible]

RL DRAKE

[illegible]

hy-gain

HY-GAIN ANTENNAS

[illegible]

HY-GAIN CRANK-UP TOWERS

[illegible]

Kantronics

KANTRONICS

[illegible]

DISCOUNT CATALOG

TUFTS ELECTRONICS

61 Lowell Rd.
Hudson, N.H.

NEW LOWER PRICES

PALADIN

		REGULAR	SALE
1751	TESTER 6-460VAC/DC LEAD PROBE STYLE		19.50
1755	AS ABOVE PLUS CONTINUITY AND AUDIBLE		24.50
1752	CONTINUITY/VOLTAGE TESTER		18.50
1200	COAX STRIPPER RG58 RG59 RG8 ETC		34.50
1115	COMPACT SELF ADJ WIRE STRIPPERS 16-30AWG		32.50
1820	ROUND CABLE SLITTER UP TO 4/0 CABLE		19.50
1700	RESOLDERING TOOL PLUNGER STYLE DELUXE		16.50
1701	AS ABOVE WITH MINIATURE TIP		16.50
2712	REPLACEMENT TIPS FOR 1700		2.50
2714	REPLACEMENT TIP FOR 1701		2.50

RECORD-A-CALL

		REGULAR	SALE
AUTO 60A	AUTOMATIC PHONE ANSWERING	149.95	136.50
VOX 700	AS ABOVE WITH VOX UNLIMITED MSG CAPACITY	199.95	179.50
REMOTE 80A	ALL ABOVE PLUS REMOTE PLAYBACK FOR MSGS	299.95	257.50
REMOTE 90A	ALL ALBOVE PLUS REMOTE OUTGOING MSG CHG	369.95	311.50
OC12L	ENDLESS LOOP OUTGOING TAPE 12 TO 120 SEC		6.50
IC30R	LEADERLESS INCOMING MSG TAPE 30 MIN		3.50
IC60R	AS ABOVE 60 MIN		5.50
RK-1	EXTRA REMOTE KEY FOR 80A SPECIFY MSG		29.50

NYE VIKING

		REGULAR	SALE
MASTER KEY	CW KEY W/ HEAVY BASE NAVY KNOB AND CABLE		24.50
310-003	STANDARD CW KEY W/ SWITCH		12.00
312-003	BRASS PLATED CW KEY W/ SWITCH		13.50
320-003	NICKEL PLATED HEAVY DUTY CW KEY W/SW		14.50
321-003	CHROME PLATED HEAVY DUTY KEY W/SW		22.50
322-003	BRASS VERSION OF 320-003		15.50
604-002	CODE PRACTICE SET W/KEY		22.50
SSK-1	DUAL PADDLE SQUEEZE KEY WITH BASE		29.50
SSK-1CP	CHROME-PLATED SSK-1		38.50
046-003	HY-BRID PHONE PATCH WITH SPEAKER		67.50
SSK-1K	IAMBIC KEYER W/SQUEEZE PADDLE 110VAC/9VDC	105.00	94.50
SWR-001	AUTOMATIC SWR WATTMETER	99.00	89.50
020-021	LOW PASS FILTER 2-30 MHZ 2KW	24.50	22.50

NYE VIKING TUNERS

ROBOT

ROBOT RESEARCH

ROHN TOWER

SHURE MICROPHONES

SONY SHORTWAVE

SONY WALKMANS

FREE
WITH PURCHASE OF
3-TBA ANTENNA

ALLIANCE HD-73

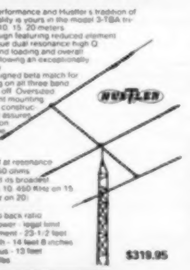
HEAVY DUTY ROTOR $159.95 Value

3-TBA Tri-Band Beam 10 - 15 - 20 METER Fixed Station Antenna

Engineering, performance and Hustler's tradition of outstanding quality is yours in the model 3-TBA tri-band beam for 10, 15, 20 meters.

Improved design featuring reduced element length and unique dual resonance high Q traps reduce wind loading and overall weight, while allowing an exceptionally wide bandwidth.

Specially designed beta match for precision tuning on all three band and static drain off. Oversized boom to element mounting and heavy duty construction throughout assures reliable operation regardless of the weather.



- Lowest SWR at resonance
- Impedance 50 ohms
- Bandwidth at its broadest (850 KHz on 10, 450 KHz on 15, and 200 KHz on 20)
- 8db gain
- 25db front to back ratio
- Maximum power - legal limit
- Longest element - 23-1/2 feet
- Boom Length - 14 feet 8 inches
- Turning radius - 13 feet
- Weight - 40 lbs

$319.95

TUFTS ELECTRONICS

SAVE
BOTH FOR ONLY
$319.95

LIMITED SUPPLY
FREIGHT EXTRA

✓88

MOR-GAIN

HALF-SIZE FULL PERFORMANCE
Multi-Band HF Communications Antennas

MOR-GAIN HD Dipoles
- One half the length of conventional half-wave dipoles
- Multi-band, Multi-frequency
- Maximum efficiency - no traps, loading coils, or stubs
- Fully assembled and pre-tuned - no measuring, no cutting
- All weather rated - 1 KW AM, 2.5 KW CW or PEP SSB
- Proven performance - more than 10,000 have been delivered
- Permit use of the full capabilities of today's 5-band xcvrs
- One feedline for operation on all bands
- Lowest cost/highest performance antenna on the market today
- Highest performance for the Novice as well as the Extra-Class Op

MOR-GAIN

FOX RADAR DETECTORS

JW MILLER FILTERS

KLM POWER AMPS

JW MILLER

LARSEN ANTENNAS

MFJ

MFJ FILTERS

MFJ KEYERS

MFJ ANTENNA TUNERS

BENJAMIN MICHAEL

HAM-KEY

HENRY POWER AMPS

TELEX

TELEX HEADSETS

TEN-TEC

TEN-TEC INC

TRAC

TRAC ELECTRONICS

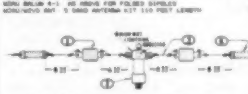
TRIONYX IND

VAN GORDEN ENG

VIBROPLEX

VO COMM PRODUCTS

UNADILLA/REYCO



W2AU/W2VS • 5 BAND 10/80 METER ANTENNA KIT by UNADILLA/REYCO

GIVES YOU OPERATION ON 10 • 15 • 20 • 40 • 80 METERS

(DESIGNED CLOSELY TO 5 BAND TRAP DIPOLE PARAMETERS PER A.R.R.L. HANDBOOK, HF ANTENNA CHAPTER 21 'A MULTIBAND TRAP ANTENNA')

Every Component of This Kit is a Highly Crafted, old Line UNADILLA/REYCO Product Time Tested by HAMS, COMMERCIAL & ARMED FORCES FACILITIES - AROUND THE WORLD - FOR OVER 10 YEARS!

COMPLETE KIT (Nothing else needed)
- 2 ea W2VS REYCO KW-40 TRAPS
- 1 ea W2AU 'BIG SIGNAL' BALUN 1:1
- 120 Ft. RUGGED #14-7 Strand Copper Wire
- 2 ea W2AU SHATTERPROOF END-Insulators
- INSTRUCTIONS

WELLER

YAESU

YAESU ELECTRONICS

YAESU VHF/UHF

OPEN DAILY 9 - 6
SUNDAYS 12 - 5

MODEL	DESCRIPTION	QTY	UNIT PRICE	PRICE

(SEND $1 FOR OUR ENLARGED CATALOG)

NAME — MINIMUM SHIPPING 3.50
ADDRESS — NO SALES TAX IN NH 0
CITY — STATE — ZIP — TOTAL
CHECK — MASTERCARD — VISA
CARD NR — EXP DATE
SIGNATURE — (PRICES SUBJECT TO CHANGE WITHOUT NOTICE)

ORDER BLANK

61 LOWELL RD., HUDSON, N.H. 03051
TEL: (603) 883-5005

Hi Pro Mk II

LB-VHF-UHF REPEATERS SOON TO BE FCC TYPE ACCEPTED

AMATEUR DISCOUNTS AVAILABLE

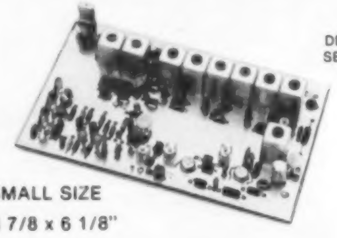
SUPERIOR RECEIVER AND TRANSMITTER SPECIFICALLY DESIGNED FOR REPEATER SERVICE.

ADJUSTABLE TRANSMITTER POWER, FROM 1 TO 25 WATTS MINIMUM OUTPUT WITH EXTREMELY COOL OPERATION. — AUTOMATIC BATTERY BACK UP SYSTEM CAPABILITY WITH BATTERY CHARGING AND REVERSE POLARITY PROTECTION. — NOW WITH A FULL COMPLIMENT OF INDICATORS AND STATUS LIGHTS. — 100% DUTY CYCLE — ADVANCED REPEATER SQUELCH SYSTEM **NO CHOPPING, POPPING, OR ANNOYING REPEATER KEY UPS DURING LIGHTNING STORMS.** — DIE CAST ALUMINUM R.F. ENCLOSURES — SMALL SIZE 5¼ X 19 x 13" — HIGH QUALITY LONG LIFE DESIGN.

Hi Pro Mk II
Maggiore Electronic Laboratory
FM Repeater
I.D
ACTIVATE
T.O.
TIMER
RCVR
ACTIVE
AC
ON
METER SWITCH
DISCRIMINATOR
SIGNAL
MICROPHONE
LOCAL VOLUME
OFF
SUPPLY
ON
OFF
MODE
REPEAT
SIMPLEX
TRANSMIT
ON
SUPPLY
ON

Hi Pro RECEIVER AND TRANSMITTER

NOW USED IN ALL HI PRO REPEATERS
ALSO AVAILABLE IN KIT FORM



SMALL SIZE
3 7/8 x 6 1/8"

HI PRO TRANSMITTER
DESIGNED FOR REPEATER SERVICE WITH EXCELLENT AUDIO, STABILITY, HARMONIC REJECTION, AND LOW SIDEBAND NOISE.

ADJUSTABLE POWER OUTPUT — UP TO 5 WATTS FROM THE EXCITER BOARD. COOL OPERATION.

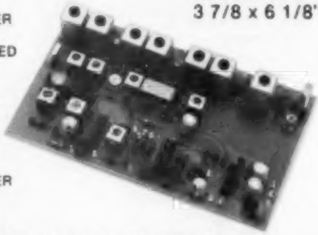
THIS EXCITER IS USED TO DRIVE THE HI PRO 25 WATT POWER AMPLIFIER AND IS AVAILABLE KIT OR ASSEMBLED.

HI PRO RECEIVER
THIS RECEIVER IS THE HEART OF THE REPEATER AND BOASTS SUPERIOR SQUELCH ACTION NEEDED FOR THIS TYPE OF SERVICE. EXCELLENT SENSITIVITY, STABILITY AND SELECTIVITY.

USE THIS RECEIVER TO REPLACE THAT TROUBLESOME RECEIVER IN YOUR PRESENT REPEATER.

WRITE FOR COMPLETE SPECIFICATIONS ON OUR FULL LINE OF ACCESSORIES AND LOWER COST REPEATERS.

SMALL SIZE
3 7/8 x 6 1/8"



✓46

MAGGIORE ELECTRONIC LAB.

590 SNYDER AVE.
WEST CHESTER, PA. 19380

PHONE 215-436-6051

1ST ANNIVERSARY PLUS SPECIAL SALE

RADIO ACTIVITY

531 WEST COLLINS DRIVE
CASPER, WYOMING 82601

MOBILE DX PACKAGE KENWOOD TR7850 DTMF 40 WATT 15 MEMORY **PLUS** DAIWA DA200 ANTENNA 7/8 WAVE 5.2 dB GAIN	$449. PPD
YAESU FT208R (2 METER) OR FT708R (70 CM) HT 16 DTMF 10 MEMORY NICAD BATTERY **PLUS LEATHER CASE**	$359. PPD
ICOM 551D (6 METER) WITH PS 20 AC SUPPLY **PLUS EX106 FM OPTION**	$928. PPD
YAESU FT107M (160-10M) WITH DMS **PLUS** FP107E POWER SUPPLY **AND** SP 107 SPEAKER	$1149. PPD

ORDER FROM THIS AD, CHECK ACCEPTED UPON CLEARANCE

PLUS

LARRY WB7UJY AND
WILLY DEAN ✓315

GET COMPETITIVE...GET DATONG!

World's finest accessories for the serious operator

FL-2 MULTI-MODE AUDIO FILTER

DATONG
MULTI-MODE FILTER - MODEL FL2

Installs in speaker line. Provides independently adjustable Lo-Pass *and* Hi-Pass cutoff frequencies between 200-3500 Hz in CW mode. Shape factor apx. 1.4:1 on a 5:50 db scale. Peak/notch mode provides up to 45 db action.

$199.95

ASP — RF SPEECH PROCESSOR

DATONG — AUTOMATIC R.F. SPEECH PROCESSOR

Installs in MIC line. RF clipping with speech shaping from 0 to 30 db in 6 db steps. Frequency response 400-3400 Hz ± 3 dbs. Total harmonic distortion at 1 KHz, at 30 db clip level — 1/2%. Accepts Hi or Lo impedence MICs.

$169.95

D-70 CODE TUTOR

LETTERS
MIXED
NUMBERS
MORSE TUTOR
DATONG
MODEL D70

Teaches morse code. Programmed for random letters and numbers. Sends random 5 character groups between 6-37 wpm with adjustable character spacing from normal to 3 seconds.

$99.95

PLUS THREE EXCITING NEW PRODUCTS:

- **RFA PRE-AMP** — provides RF switched, broadband (5-200 MHz) Pre-Amp for improved receiving sensitivity. **$64.95**
- **CODECALL** — adds 4096 selective tones for call facilities to any FM, AM or SSB transceiver. **$64.95**
- **DF-1 DIRECTION FINDER** for any FM transceiver. 16 LED compass point readout (32 pts interpolated) **$379.95**

SEE THESE PRODUCTS IN ACTION. VISIT OUR BOOTH AT THE DAYTON HAMVENTION.

- ALL DATONG PRODUCTS CARRY A 90 DAY WARRANTY
- VISA-MASTERCARD WELCOME

DATONG ELECTRONICS LIMITED

AR Technical Products Corp.

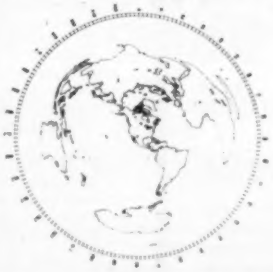
P. O. Box 62
155 S. Bates Street
Birmingham, Michigan 48012
Phone (313) 644-5698

329

DXPEDITIONS INTERNATIONAL

"Making DXpeditions A Reality"

THE WEEKLY DX NEWSLETTER FOR ALL AMATEURS



52 WKS.	$28 (US)	N. AMERICA
	$40 (US)	ALL OTHERS

Name ____________________

Address ____________________

City __________ St. ______ Zip ______

DXI. 999 WILDWOOD RD., WAYCROSS, GA. 31501

Your Ham Tube Headquarters!

TUBES BOUGHT, SOLD AND TRADED
SAVE $$$ - HIGH $$$ FOR YOUR TUBES

MONTHLY SPECIALS

3-400Z	$85.00	6883B	6.75
3-500Z	85.00	7360	9.15
4-400A	80.00	7735A	29.50
4CX250B	50.00	8122	79.50
572B	36.50	8156	10.95
811A	12.00	8873	175.00
813	45.00	8874	175.00
6146B	6.50	8877(3CX1500A)	450.00
6360	4.95	8908	10.50

E.F. JOHNSON Sockets For 3-500Z & 4-400A @ $9.95
LARGEST EIMAC DISTRIBUTOR—CALL
BRAND NEW **** FACTORY GUARANTEED
TOP BRAND Popular Receiving Tube Types
FACTORY BOXED 75/80% OFF LIST
FREE LIST Available
Includes full line of RF Power Transistors.
Minimum Order $25.
Allow $3.00 Minimum for UPS Charges
40 watt RF power transistor 2N6084-$13.50
Linear RF transistors in stock.
Write or phone for free catalog.
TUBES—BOUGHT,SOLD AND TRADED
Premium Prices Paid for EIMAC TUBES

CeCo

Use toll free no.
800-221-0860

COMMUNICATIONS, Inc. 92
2115 Avenue X
Brooklyn, NY 11235
Phone (212) 646-6300

SERVING THE INDUSTRY SINCE 1922

DOUBLE BAZOOKA COAXIAL ANTENNA

- Injection Molded Plastic Fittings for Strength, Durability and Weather-proofing.
- Broad Banded Low VSWR
- No Tuner or Balun Required
- Feed With Any Length 50 Ohm Coax
- Power Handling Capacity - Two Kw
- Not A Kit - Ready For Use - Made in USA
- Steel Eyeletts For Installation and SO-239 Fitting Are Molded Into Antenna

80 or 40 Meter	49.95 ea.
20, 15, or 10 Meter	44.95 ea.

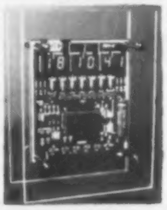
power gain systems
1007 Cypress
West Monroe, La. 71291
96

☐ Payment enclosed $__________
☐ VISA ☐ MC
Card no.__________ Exp. date__________
Signature__________
Name__________
Address__________
City__________ State____ Zip______

CLOCKS & KITS

SEE THE WORKS CLOCK

Our Easiest Clock To Assemble



Model 850

Six digits LED clock. 12 or 24 hour format. Attractive clear plexiglas stand. Kit is complete including precut and drilled plexiglas stand and all hardware. Size: 6" H x4-1/3" W x 3" D

Model 850 .... **$29.95**
Model 850 WT (Factory wired & tested) **$39.95**
Now available with GREEN LEDs
Model G850 .... **$39.95**
Model G850WT (Factory wired & tested) **$49.95**
(10% off if you buy 3 or more)

6 DIGIT CLOCK KIT

Model 5314

12 or 24 hour format. Six large .5" digits. 50/60 hz operation. Kit is complete with attractive plexiglas cabinet.

Model 5314 .... **$29.95**

MOBILE CLOCK KIT

Model 2001

6 Digit LED display. 12 or 24 hour format. Will operate 12 VDC or 12 VAC. Accurate crystal time base. LED display turns off and on with ignition if desired. Kit is complete with cabinet and 4 way mounting bracket.

Model 2001R **$29.95**
($27.95 in qtys. of 3 or more)

60 HZ CRYSTAL TIME BASE

Enable your digital clocks to run on DC power.

Model TB-1.......................................**$4.95**
Model TB-1WT (wired & tested) **$9.95**

VEHICLE INTRUSION ALARM

Easy to assemble and install, this kit offers options not normally found in other alarm systems. Hidden switch mounts under the dash. Kit has provision of sensors and remote control switch. Programmable time delays for exit, entry and alarm periods. Basic hook-up utilizes the dome light circuit activating when doors are opened. The alarm will drive a siren or pulse horn at a 1 HZ rate. Not prone to false alarms due to reliable CMOS circuitry. No external switch required. Complete kit with easy to follow instructions and diagrams.

Model ALR-1 .... **$14.95**
Model ALR-1WT (wired & tested) **$24.95**

(10% off if you buy 3 or more)

TERMS: US & Canada add 5% shipping, handling & insurance. Foreign orders add 10% (20% airmail). Orders under $20.00 add $1.50 extra handling. COD add $2.00. Visa/Mastercard welcome. Ohio residents add 4½% sales tax.

Prices subject to change without prior notice.

✓307

SEE YOU AT DAYTON
DEBCO ELECTRONICS
P. O. BOX 9169 DEPT. K
CINCINNATI, OHIO 45209
Phone: (513) 531-4499

NOW!

HAL Communications Is Proud To Announce That Our Amateur Radio Products Are Being Stocked At The Following Leading Amateur Dealer Stores:

EASTERN UNITED STATES:

AMATEUR ELECTRONICS SUPPLY
28940 Euclid Ave.
Wickliffe, OH 44092
(216) 585-7388

ELECTRONICS INTERNATIONAL SERVICE CORP.
11305 Elkin Street
Wheaton, MD 20902
(301) 946-1088

MIDWEST UNITED STATES:

AMATEUR ELECTRONICS SUPPLY
4828 W. Fond du Lac Ave.
Milwaukee, WI 53216
(414) 442-4200

DIALTA AMATEUR RADIO SUPPLY
212 - 48th Street
Rapid City, SD 57701
(605) 343-6127

ERICKSON COMMUNICATIONS
5456 N. Milwaukee Avenue
Chicago, IL 60630
(312) 631-5181

HAM RADIO CENTER
8340-42 Olive Blvd.
St. Louis, MO 63132
(314) 993-6060

THE HAM SHACK
808 N. Main St.
Evansville, IN 47711
(812) 422-0231

KRYDER ELEC.
Georgetown N. Shopping Ctr.
2810 Maplecrest Rd.
Ft. Wayne, IN 46815
(219) 485-9793

UNIVERSAL AMATEUR RADIO
1280 Aida Drive
Reynoldsburg, OH 43068
(614) 866-4267

WESTERN UNITED STATES:

AMATEUR ELECTRONICS SUPPLY
1072 N. Rancho Drive
Las Vegas, NV 89106
(702) 647-3114

CW ELECTRONICS
800 Lincoln Street
Denver, CO 80203
(303) 832-1111

HENRY RADIO, INC.
2050 S. Bundy Dr.
Los Angeles, CA 90025
(213) 820-1234

SOUTHERN UNITED STATES:

ACK RADIO SUPPLY COMPANY
3101 4th Ave. South
Birmingham, AL 35233
(205) 322-0588

AGL ELECTRONICS
13929 N. Central Expwy
Suite 419
Dallas, TX 75243
(214) 699-1081

AMATEUR ELECTRONIC SUPPLY
621 Commonwealth Ave.
Orlando, FL 32803
(305) 894-3238

AMATEUR ELECTRONIC SUPPLY
1898 Drew Street
Clearwater, FL 33515
(813) 461-4267

AMATEUR RADIO CENTER
2805 N.E. 2nd Ave.
Miami, FL 33137
(305) 573-8383

BRITT'S TWO-WAY RADIO
2508 N. Atlanta Rd.
Belmont Hills
Shopping Center
Smyrna, GA 30080
(404) 432-8006

GISMO COMMUNICATIONS
1039 Latham Drive
Rock Hill, SC 29730
(803) 366-7157

KRYDER ELECTRONICS
5826 NW 50th Street
Oklahoma, OK 73122
(405) 789-1951

MADISON ELECTRONICS
1508 McKinney Ave.
Houston, TX 77010
(713) 658-0268

N & G DISTRIBUTING CORP.
7201 N.W. 12th Street
Miami, FL 33126
(305) 592-9685

RAY'S AMATEUR RADIO
1590 US Highway 19 South
Clearwater, FL 33516
(813) 535-1416

Call Or Stop-In And See HAL Equipment At Your Favorite Amateur Dealer.

Write today for HAL's latest RTTY catalog

HAL COMMUNICATIONS CORP.
Box 365
Urbana, Illinois 61801
217-367-7373 ✓345

EXPAND YOUR HORIZONS
WITH

VHF H.T. CONVERTERS

HANDI-CON V

m²
MB
PSB
OFF
HANDI-CON

HANDI-CON U2

m²
480-484
460-464
OFF
HC-U2

- DOUBLE BAND COVERAGE
- MULTI-BAND & MULTI-CHANNELLED MONITORING WITH SCANNING H.T.'s
- 2400 CHANNEL CAPABILITY
- SINGLE 3-POSITION CONTROL
- "OFF" RETURNS TO NORMAL TRANSCEIVER OPERATION
- LOW LOSS COUPLING TO ANTENNA
- STANDARD MALE/FEMALE BNC CONNECTION
- USES SINGLE AAA CELL
- BI-LATERAL PROTECTION AGAINST ACCIDENTAL TRANSMISSION FOR UP TO 5 WATTS
- size – 2.25 x 1.5 x 1.4 inches
- weight – 4.5 ozs.

MONITORS
154 158
159–163

$47.45
incl. shipping
Calif. 6.5% tax

M-SQUARED ENGINEERING, INC

1446 LANSING AVE.
SAN JOSE, CA. 95118 ✓77

MONITORS
460–464
480–484

Introducing at
DAYTON
HAMVENTION

"LOOK FOR US IN DAYTON"

DEALER PACKAGES AVAILABLE

CLUB DISCOUNTS

Keyer Trainer

BUGGED BY MORSE CODE?

NEW . . . $89.95
Does not include DC-2
External Battery Pack

TURN THE MORSE CODE HASSLE INTO THE FUN IT SHOULD BE WITH THE NEW KEYER-TRAINER MODEL KT-2 BY AEA.

The new model KT-2 KEYER-TRAINER uses an AEA microcomputer with copywritten software, featuring exclusive automatic speed increase that literally pulls you through psychological speed barriers. Users of the model KT-1 predecessor report Morse code success never before achieved by all other methods tried. The exclusive AEA training method is increasing one's Morse speed copying ability in the shortest time, for all who want to learn.

In addition to the powerful trainer features, the KT-2 is also a full feature keyer which will interface with all the popular iambic or single lever paddles on the market. Best of all, the new KT-1 price represents a 30 percent reduction from the KT-1 predecessor.

ACCESSORIES:
Model AC-2 350 Ma 12 VDC Wall Adaptor $9.95
Model DC-2 8 Hour Rechargeable Battery Pack and Charger Unit $39.95

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

call or visit:

AEA

Brings you the Breakthrough!

TOLL FREE 1-800-331-3688
Derrick Electronics, Inc.
714 W. Kenosha
Broken Arrow, Okla. 74012

HI-Q BALUN

- For dipoles, yagis, inverted vees & doublets
- Replaces center insulator
- Puts power in antenna
- Broadbanded 3-40 MHz
- Small, lightweight and weatherproof
- 1:1 Impedance ratio
- For full legal power and more
- Helps eliminate TVI
- With SO 239 connector

$10.95

HI-Q ANTENNA CENTER INSULATOR

Small, rugged, lightweight, weatherproof
Replaces center insulator
Handles full legal power and more
With SO 239 connector

$5.95

HI-Q ANTENNA END INSULATORS

Patent No.
4 091 399

Rugged, lightweight, injection molded of top quality material, with high dielectric qualities and excellent weatherability. End insulators are constructed in a spiral unending fashion to permit winding of loading coils or partial winding for tuned traps.

May be used for
- Guy wire strain insulators
- End or center insulators for antennas
- Construction of antenna loading coils or multiband traps

$4.95

DIPOLES

MODEL	BANDS	LENGTH	PRICE WITH HI-Q BALUN	WITH HI-Q CENTER INSULATOR
Dipoles				
D-80	80,75	130	$28.95	$24.95
D-40	40,15	66	25.95	21.95
D-20	20	33	24.95	20.95
D-15	15	22	23.95	19.95
D-10	10	16	22.95	18.95
Shortened dipoles				
SD-80	80,75	90	31.95	27.95
SD-40	40	45	28.95	24.95
Parallel dipoles				
PD-8010	80,40,20,10,15	130	39.95	35.95
PD-4010	40,20,10,15	66	33.95	29.95
PD-8040	80,40,15	130	35.95	31.95
PD-4020	40,20,15	66	29.95	25.95
Dipole shorteners - only, same as included in SD models				
S-80	80,75			$11.95 pr
S-40	40			$10.95 pr

All antennas are complete with a HI-Q Balun or HI-Q Antenna Center insulator, No. 14 antenna wire, ceramic insulators, 100 nylon antenna support rope (SD models only 50) rated for full legal power. Antennas may be used as an inverted V and may also be used by MARS or SWLs.

Antenna accessories—available with antenna orders

Nylon guy rope 450# test 100 feet	$3.49
Ceramic (Dogbone Type) antenna insulators	.70 pr
SO-239 coax connectors	.55

All prices are postpaid USA 48
Available at your favorite dealer or order direct from

Dealer Inquiries Invited

Van Gorden Engineering

BOX 21305 B, SOUTH EUCLID, OHIO 44121

Flash and Crash 101

—how to weather the storm

Dave Malley K1NYK
132 Lydall
Manchester CT 06040

Lightning is one of the most common occurrences found in nature and certainly tends toward the spectacular. It is responsible for starting about 10,000 wilderness fires in this country each year and also infrequently causes deaths. Furthermore, there have been many misconceptions and superstitions invented over the years.

In spite of the losses that can be involved, the average person knows very little about this phenomenon. It would seem that hams in particular have something of a vested interest in knowing the facts so that the fate of their equipment will not be left completely up to chance. This article will deal both with how lightning occurs and the various protection methods that are available.

A lot of information has been obtained since Ben Franklin first tried to electrocute himself with his experiments about 200 years ago. Meteorological observations now have established thunderstorm activity levels on a worldwide basis. Fig. 1 shows that the annual number of these storms varies from single-digit numbers up to as high as 200 in parts of South America. Interestingly, the maximum activity occurs over land masses that are located close to the equator. This relationship to latitude mostly reflects increased evaporation and cloud formation in the hotter climates.

Similar data has been generated for thunderstorm frequencies encountered across the United States. South Florida has the distinction of having the highest annual activity—100 thunderstorm days. Fig. 2 shows the thunderstorm activity throughout our country and can be used as a partial guide for determining the typical frequency in your area.

The information presented in Figs. 1 and 2 shows the number of days that thunder was heard and does not tell whether a lightning flash goes to ground or is contained inside the cloud. Furthermore, the number of flashes to ground increases substantially with increasing distance *away* from the equator (Fig. 3). Severity of storms is not reflected by the data at all. (A more precise method might involve recording thunderstorm duration instead of just occurrence.) Consequently, these activity levels should be considered as relative information rather than absolute values.

The clouds that typically are responsible for thunderstorms and lightning are termed cumulonimbus. These so-called "thunderheads" are usually very large and reach overall heights of 35,000 feet. The temperature at the top of the cloud is a rather brisk −40° F. Such a cloud formation will spread out horizontally over several miles. Lest you think that lightning is produced only by thunderstorms, you might be interested to know that sever-

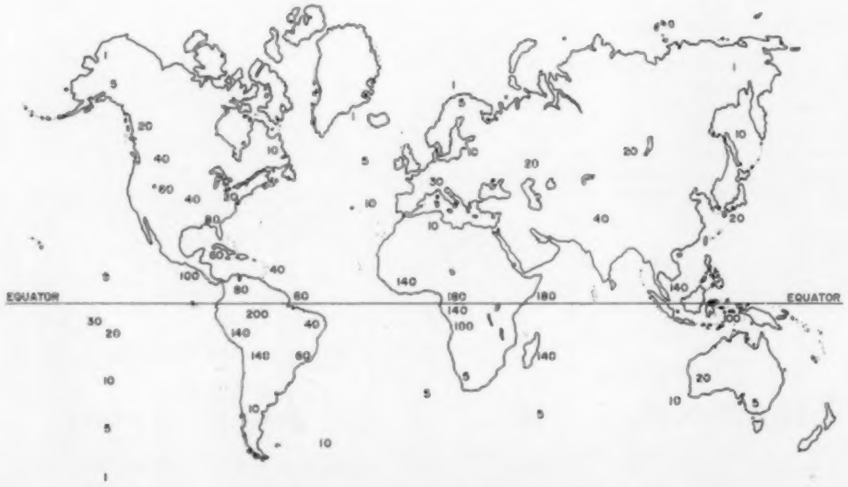


Fig. 1. Annual frequency of thunderstorm days.

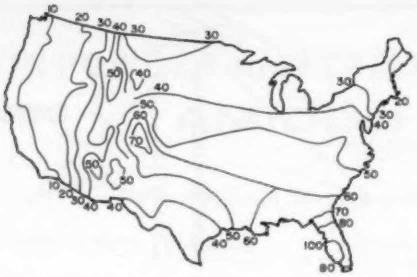
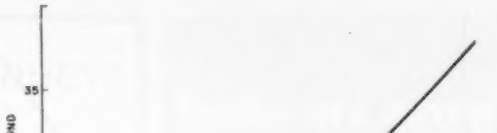


Fig. 2. Typical annual US frequency of thunderstorm days (Ref. 1).



al other possibilities exist as well. These include: sandstorms, snowstorms, and clouds located over erupting volcanos (Reference 1). Lightning associated with snowstorms occurs often enough to be a concern to aircraft. Back on the ground, though, we will be interested in the common thunderstorms.

Contrary to widespread belief, lightning does not come instantly crashing down to the Earth whenever Zeus is angry. In fact, it does not always come *down*, but occasionally can extend up to the cloud. These items are in the folklore that we'll try to set straight. Lightning actually consists of several stages. These are: the leader, initial return stroke, residual decay current, and usually one or more restrikes (Reference 2). The high-current portion occurs in about 10-100 microseconds while the total cycle takes up to 0.25 seconds. The rate of propagation is something less than the speed of light because of inductance and capacitance effects along the path.

The source of energy that ultimately creates the discharge is presumed to be warm air rising toward the top of the cloud. The charging process in the cloud is thought to happen as a result of falling ice crystals. Portions of these crystals splinter off and become electrostatically charged. Wind currents then carry these positive charges up to the cloud's ceiling. The heavier remaining portions of the ice accumulate a negative charge at the bottom of the cloud.

Other theories also exist, but their common denominator is that the cloud contains one or more localized "cells" where the lower part of the cell is negative. Local potential differences can reach many millions of volts inside the cells. Relative to the Earth, the cell (cloud) has a net negative potential and a lifetime on the order of a half hour.

As the cloud comes overhead, the ground underneath it takes on a positive charge. Put more accurately, negative ions in the ground are repelled from the area directly under the cloud formation. When a vertical conductor (flagpole, tower, etc.) is present, an intense field concentration occurs at its tip which can exceed the breakdown (dielectric) strength of the air. This causes microampere "point-discharge" currents characterized by a bluish corona. Sailers used to call this corona St. Elmo's fire after a Mediterranean patron saint. Incidentally, this effect will cause severe local static. This is one reason why vertical antennas have a ball rather than a point at their tip. The ball's larger radius tends to reduce the possibility of corona discharges and their effects on reception.

Eventually, a column of ionized air called a pilot streamer reaches out from the cloud toward the ground. Afterwards, a more intense discharge takes place in the form of a series of incremental steps. This is referred to as the step-leader. This leader and its branches bring the negative cloud potential closer to the Earth—reduce the spark gap, if you will.

Earlier, it was noted that leaders occasionally start from the ground and nearly reach up to the cloud. Fig. 4 shows that fewer than 5% of the leaders associated with a 100-foot tower will behave like this. In all lightning discharges, however, short streamers extend upward from the object just before the discharge. This is the same phenomenon as St. Elmo's fire. When the two streamers connect, they provide a highly conducting path (filament) which allows the charge in the tip of the leader to flow to the ground.

As this current becomes higher, the filament impedance is reduced and more current flows. This reduces the charge at the leader's tip, allowing the conducting arc to reach higher up into the filament channel. Consequently, this arc propagates *up* to the cloud and is called the return stroke. The speed of this return stroke is much faster than the step-leader that was "feeling" its way down to Earth. However, the overall speed of propagation is only about one-third that of the speed of light.

Generally, people are not aware of this return stroke. However, this is what actually produces the bright lightning flash as well as the thunder. The light involved is simply a result of the arc itself, while the high currents result in rapid expansion of the surrounding air. This causes the thunderclap. An old rule of thumb says that your distance from the spot where the lightning struck, measured in miles, is equal to the number of seconds between the flash and the thunder.

The currents flowing during the return stroke average about 25,000 Amperes. Currents above 150k Amps have been recorded, but those over 80,000 Amps are rare. By comparison, the step-leader currents typically are in the tens or hundreds of Amperes. The high-current values are measured indirectly as you

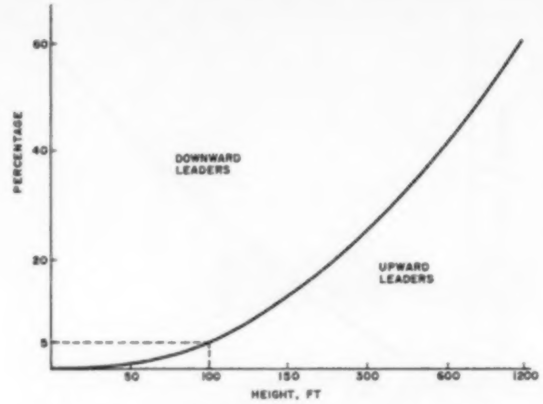


Fig. 4. Percentage of upward leaders is slight without very tall structures.

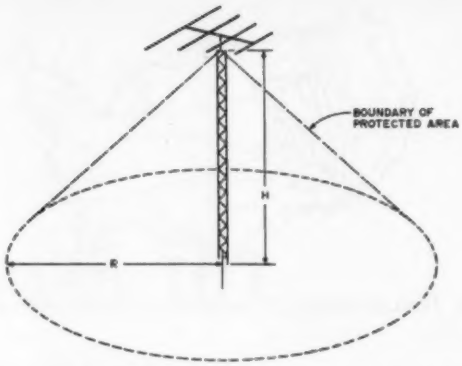


Fig. 5. Sketch showing principle of protective cone where the radius (R) at protective area (dotted) is equal to the tower height (H).

might imagine. Originally, small bundles of steel strips called magnetic links were placed perpendicularly near whatever was expected to be hit. Any eventual lightning current would magnetize the links, and the amount and direction of the current flow could be deduced. Recently, similar methods have used magnetic recording tape where the strike partially erases a pre-recorded signal of known strength. Again, the current would then be calculated.

The final phase in the overall lightning process consists of a low-level continuing current which provides the opportunity for at least one more immediate restrike. This usually happens about 200 millseconds (0.200 sec.) after the initial strike. This additional discharge invariably hits the same point on the Earth as its predecessors. This fact alone indicates that lightning can strike the same spot more than once.

Several factors can increase the probability of a building, tower, or whatever being struck. Geographic effects were mentioned earlier. Most of the others are not surprising. The type of terrain is important, with the valleys being struck less often than higher elevations. For a given location, the possibilities increase as the square of the height of objects above ground.

Grounding a tower will help reduce the amount of electrostatic charge present. This can help avoid a strike since the field strength at the top of the tower will be considerably lower, and upward streamers will find it that much harder to form. More important, though, the good ground will allow the current to be safely discharged into the ground.

Another factor is that the tower (or highest object) creates a so-called cone-of-protection which protects other structures inside this cone. An example of this could be your house. The actual area protected is not well established, although a conservative figure seems to be that the radius of the cone is equal to the tower height (Fig. 5).

There are quite a number of ways to increase the protection of your equipment during a thunderstorm without going broke in the process. However, you should realize that there is no absolute protection short of tossing all transmission lines, rotor cables, etc., out of the window and unplugging the radio. (Even this assumes that you thought to take action well ahead of the storm and were at home to do so. Do not disconnect these cables just before the storm or when it is in progress.) Fortunately, there are some things that can be done that don't require you to be a recluse in the house.

The first major step is to provide all of the station equipment with a good earth ground. This means that all equipment in the house should be attached (bonded) to an outside ground rod using as short a length of heavy wire as possible. The standard rod is a 0.5-inch copper bar driven eight feet into the ground. This provides a low-impedance path. Experiments have shown that larger diameters or greater depths do not provide better performance. These rods can be bought from local electrical supply houses.

You should avoid copper-plated steel bars because the plating will wear or corrode off leaving a rusty ground rod. There goes any low impedance! Simply check your ground rod to make sure it is not magnetic. If it is really necessary to ground to a water pipe in the house, use a cold water pipe since corrosion can break the electrical continuity of the hot water ones. Also, check to see that the water meter has been bridged with a heavy wire.

At least two of the tower legs should be attached to individual ground rods. These should be driven into the ground rather than through the concrete and into the ground. The same store that carries the rods usually also will stock brass clamps to secure the wires to the tower and the ground stakes. Remember to similarly treat any guy wires. Copper is best for the ground wires, but if aluminum is used, it should be about a #2 size. Don't run aluminum through the concrete since corrosion will ruin the wire in short order.

The wires to each rod should be short and as direct as possible with no kinks or sharp bends. Lightning does not want to turn corners! No ground wire should be placed through a metal conduit. This setup would act as an rf choke and encourage the lightning to find an alternate route. If you are compelled to be neat, use porcelain or some other non-metallic material for the pass-through.

Methods also are available to reduce the risks of strikes to antennas. Again, bleeding off electrostatic-charge buildups caused by rain and snow is helpful. Some antennas such as ground-mounted verticals and beta-matched beams

IRON POWDER and FERRITE PRODUCTS

AMIDON Associates ✓334

Fast, Reliable Service Since 1963

Small Orders Welcome **Free 'Tech-Data' Flyer**

Toroidal Cores, Shielding Beads, Shielded Coil Forms
Ferrite Rods, Pot Cores, Baluns, Etc.

12033 OTSEGO STREET, NORTH HOLLYWOOD, CALIFORNIA 91607

A TRUE STATE-OF-THE-ART COMMUNICATIONS TERMINAL!

NEW M-500 ASR
from INFO-TECH

$1475.00
(with 12" Monitor)

$180.00
MEMORY EXPANSION BOARD (contains mailbox systems)
(10K of Memory)

For use by amateur radio operators in the transmission and reception of RTTY (ASCII & Baudot) and Morse code. Microprocessor controlled with 20K of memory (8K ROM, 8K RAM, 4K video RAM).

User programmable messages, Sel-Cal, WRU, mailbox, real time clock, large running buffers, buffers for printers, basic word processing for on-screen editing, full and half duplex, cassette tape interface, split screen formats, ASCII or Baudot printer outputs, autostart, push to talk, accessory switches, provisions for battery back-up, many other features.

The M-500 consists of three parts:

1. KEYBOARD. Connected to mainframe by 5-ft. umbilical cord for maximum operating flexibility. Entire system keyboard controlled.
2. MAIN FRAME. Houses 95% of the electronics, all I/O jacks, power supplies, modulator, demodulators. Metal frame cabinet is table top or rack mounted.
3. 12" VIDEO MONITOR. High quality to insure undistorted video, provide flexibility for operating position placement.

Order direct or from these dealers:

Carlten
5640 S.W. 116th Ave.
Miami, Florida 33173
(305) 271-3675

Colmay Products
14903 Beachview Ave.
White Rock, B.C., Canada V4B1N8
(604) 536-3058

Dialta Amateur Radio Supply
212 48th St.
Rapid City, South Dakota 57701
(605) 343-6127

Electronic Equipment Bank
516 Mill St.
Vienna, Virginia 22180
(703) 938-3350

Giller Associates, Inc.
52 Park Ave.
Park Ridge, New Jersey 07656
(201) 391-7887

Global Communications
606 Cocoa Isles Blvd.
Cocoa Beach, Florida 32931
(305) 783-3624

Ham Radio Center
8343 Olive Blvd.
St. Louis, Missouri 63132
1-800-325-3636

Memphis Amateur Electronics
1445 Wells Station Rd.
Memphis, Tennessee 38108
1-800-238-6168

Michigan Radio
38270 Mast
Mt. Clemens, Michigan 48045
(313) 469-4656

N & G Distributing
7201 NW 12th St.
Miami, Florida 33126
(305) 592-9685, 763-8170

Radio World
Terminal Building
Oneida County Airport
Oriskany, New York 13424
(315) 736-0470
1-800-448-9338

Ray's Amateur Radio
1590 U.S. Highway 19 South
Clearwater, Florida 33516
(813) 535-1416

Universal Amateur Radio
1280 Aida Dr.
Reynoldsburg, Ohio 43068
(614) 866-4267

INFO-TECH ELECTRONIC EQUIPMENT

Manufactured by: ✓35
DIGITAL ELECTRONIC SYSTEMS, INC.
1633 Wisteria Court • Englewood, Florida 33533
813-474-9518

Ducks are getting smaller! and...

better!

Because you and the leading radio manufacturers want the best-performing, the best looking antenna; Centurion has grown to be the Duck leader. We've developed many smaller antennas to make the hand-held radio perform better, and now the newest duck...the Tuf Duck "mini". It's shorter (about 3") yet it's a full 1/4 wave radiator on VHF.

Actual Size

SEE US AT THE DAYTON HAMVENTION

CENTURION
TUF DUCK™
ANTENNAS

CENTURION ✓102
Phone 402/467-4491
Telex 48-4377 CENTURION LCN
P.O. Box 82846 Lincoln, NE 68501 2846

✓See List of Advertisers on page 130

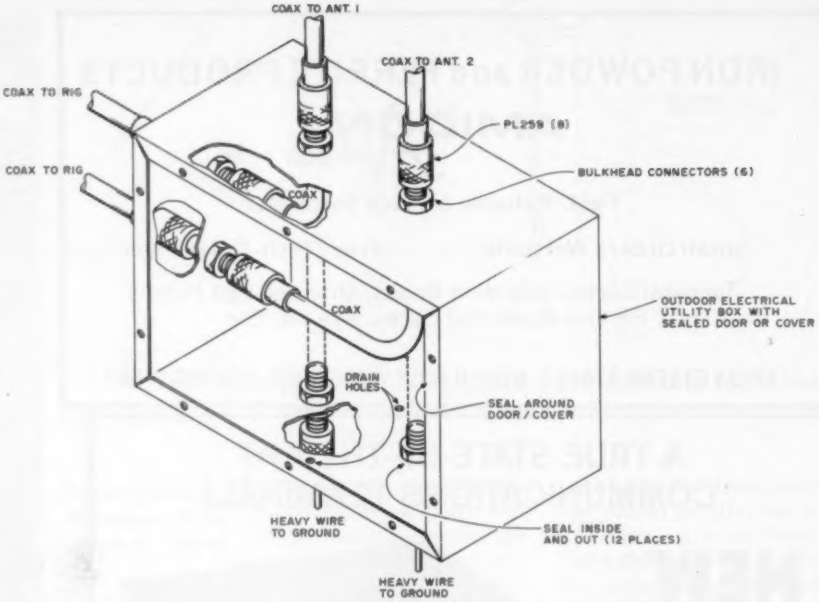


Fig. 6. Sketch showing grounding box configuration for coaxially-fed antennas.

are already at ground potential and require no further attention in this regard. If this is not the case and coaxial feedlines are used, a device such as Cushcraft's Blitz-Bug can be inserted in the coax near ground level where its case can be grounded. This device contains a built-in spark gap that will bleed off excess charges to ground.

There are other tricks that can be used with coax, also. I made several one-foot diameter turns in the coax at the base of the tower. This took up excess cable lengths and also provided an rf choke to help discourage the lightning from entering the house. A right-angle turn right after the choke arrangement performs similarly. Compared to your transceiver, the price of new coax is cheap!

When the station is not being used, the antenna switch should be turned to its ground position. Since extended inactivity periods occur with vacations, etc., it is convenient to home-brew a coax grounding box which is mounted to the tower or to a ground stake. Such a device is shown in Fig. 6.

An outdoor utility box with a hinged or removable cover and a good weather-tight seal forms the basis of the unit. Three male-male coaxial feedthrough connectors (UG363) are needed for each coaxially-fed antenna. Inside the box there is a short length of coax with PL-259 connectors attached to each end. One of the groups of three feedthough (bulkhead) connectors is located in the bottom of the box and its center conductor is grounded.

During normal use, a patch cord is connected directly from the antenna to the coax running to the radio. However, before the vacation, this patch cord is changed over to the grounded connector. This grounds the antenna directly and essentially eliminates the chance of a direct hit from entering the house via the coax lines. Remember to be sure to seal the holes around each connector mounted on the box. Silicone rubber, RV, or other compounds can be used effectively for this purpose. It is a good idea to drill one or two small holes (1/16-1/8 inch) in the bottom of the box to allow for condensate drainage.

If your station uses an open-wire transmission line, the above suggestions are not appropriate without some modification. However, this situation was covered long before we started using coax. The time-proven method of protecting gear in this case is to use an air gap (Fig. 7). The gap distance is chosen to be too large for the signal to bridge but small enough to allow lightning to jump across it and continue on to ground. Various handbooks deal with these air gaps in detail, and various things including spark plugs have been used.

In the potpourri department, a comment or two come to mind regarding roof-mounted VHF/UHF antennas and even the TV ones as well. Most people are aware that the mast that supports these antennas should be grounded. A typical installation involves bringing the transmission line, rotor cable, and the ground wire down the side of the house in a neat parallel manner. Electrically, though, it is not so pleasing. In the event of an actual strike, the lightning has a choice of paths to ground. Side flashes from the ground wire to one of the other cables is also possible. This problem can be overcome by making sure that the ground wire is the shortest and placing the other wires away from it. Again, we see the rule of thumb regarding short, direct ground wires coming into play.

One should realize that damage to electronic equipment does not necessarily require a direct lightning strike. Relatively large voltages (spikes) can be in-

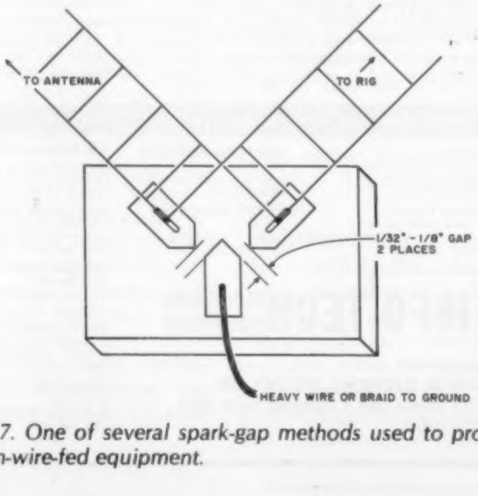


Fig. 7. One of several spark-gap methods used to protect open-wire-fed equipment.

THEY TALK

Spies . . .
Smugglers . . .
Pirate Stations . . .
Secret Police . . .
Foreign Agents . . .

YOU LISTEN

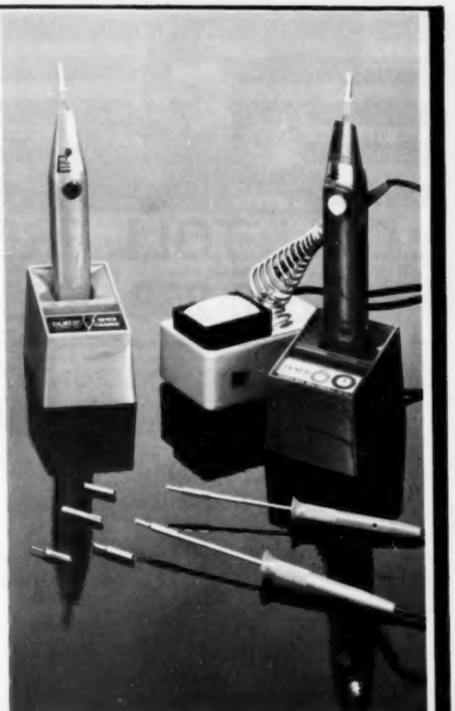
- ★ Miniature Active Antennas
- ★ Scanner Signal Boosters
- ★ Frequency Converters
- ★ Frequency Lists
- ★ Antenna Tuners
- ★ Code Breakers

- ■ Low cost
- ■ Fully guaranteed

FREE CATALOG
For more information write:
GROVE ENTERPRISES
Department C
Brasstown, N.C. 28902
GROVE

2 great names,
2 dozen soldering irons.

All from Wahl



The Iso-Tip® line
gives you a choice of 5 cordless soldering irons, with power to 50 watts. And 3 compact corded soldering irons of 15, 27 and 50 watts. Plus changeable tips and accessories.

The Oryx® line
offers 16 miniature soldering irons in various combinations of low voltages and wattages to work on heat-sensitive components. Plus tip options and accessories.

Write for new free catalog

WAHL CLIPPER CORPORATION
Sterling, Illinois 61081 • (815) 625-6525

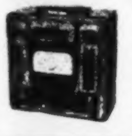
✓103

VARIAC
O-120V/2A
5.95

3 FOR 1.00
MINIATURE MOTOR
1½ TO 3 VDC

D.P.D.T. TOGGLE SWITCH
with neutral center
2 FOR 1.50

30 assorted miniature and sub-miniature I.F. transformers
Price $1.97



TS-375/U VACUUM TUBE VOLTMETER, AC volts ranges from 1.2 to 120 VAC in six steps; DC volts from 1.2 to 300 VDC. Frequency response from panel terminals: 40 Hz to 50 Khz; or 10 Khz to 150 Mhz using probes. With both AC and DC probes. Power required: 115 VAC 60 Hz. Size: 10½ × 10½ × 6¾; Shpg. wt: 23 lbs. Used. Price: Reparable, $12.00

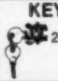
COAX CONNECTORS
1 PL-259/RG-8U
2 Reducer. For RG-58U cable. Pkg. of 2.
2 Reducer. For RG-59U. Pkg. of 2.
3 Panel Mount Receptacle. SO-239.
60¢ each

4 PDT RELAY
POTTER BRUMFIELD
14 pin style
3 amp contacts
24 volt dc
2 FOR 2.00

TRANSFORMERS
24VCT/3A, 8.6V/.5A
MANY OTHERS
2 FOR 5.00 120 volt

TERMS
•Quantities Limited
Mon.-Fri. 9 AM-5 PM
Saturday 10 AM-2 PM
•Min. Order $5.00
•Add Postage
•Calif. Res. Add 6%
•Prompt Shipping
SEND FOR FREE CATALOG

KEY LOCK
2 FOR 1.00



ELECTRONICTOWN INC.
440-7th AVE. BOX 2048 SAN DIEGO, CA 92112
West Coast Div. Phone: (714) 234-9871
✓119

TRANSI-TRAP

Lightning & Static Protectors

Models LT, LT/N

Don't hook-up your coax without one!

Models R-T, HV

Protects sensitive solid state components in your equipment from high-surge voltages produced by nearby lightning strikes, high wind, and static build-up. Even distant storm fronts are known to cause damaging surges without warning or time for grounding.

The replaceable Arc-Plug™ cartridge, which can fire thousands of times, utilizes a special ceramic gas-filled tube with precisely tailored firing speed and level, safely by-passing surges to ground. Standard air-gap devices are ineffective due to their erratic performance.

Transi-Trap Protectors are the first devices in the industry designed with "isolated ground." This keeps damaging arc-energy off the chassis and routes it directly to ground.

Models Available: (50 ohms. 200 W models are most sensitive, best for RCVRS and XCVR's. 2 kW models designed for amps. All models include Arc-Plug cartridge.)

with UHF Connectors

Model LT Protector, UHF-type "T" connector handles 200 W output thru 2 meters . . **$19.95**
Model R-T Protector, handles 200 W output thru 500 MHz **$29.95**
Model HV Protector, handles 2 kW output thru 500 MHz **$32.95**

with N Connectors

Model LT / N Protector, N-type "T" connector, handles 200 W output thru 1 GHz **$39.95**

Replacement Arc-Plug Cartridges
for Models LT **$9.95**, LT / N **$19.95**,
R-T **$9.95**, HV **$12.95**

Ohio residents add Sales Tax. **MasterCard, Visa, checks accepted.** Order by phone or mail.

AlphaDelta Transi-Trap Protection Systems are designed to reduce the hazards of lightning-induced surges.
These devices, however, will not prevent fire or damage caused by a direct stroke to antenna or other structure.

ALPHA DELTA COMMUNICATIONS
P.O. Box 571, Centerville, Ohio 45459 • (513) 435-4772

CALL TOLL FREE
1-800-238-6168

In TN. call 901-683-9125
MEMPHIS AMATEUR ELECTRONICS
(Formerly-Germantown-Sere-Rose)

Authorized Dealer for: Kenwood, Yaesu, Icom, Drake, Mirage, AEA, Info-Tech, Ten-Tec, MFJ, Cubic, and B&W.

MON–FRI 9:00—5:00
SAT 9:00—12:00

✓139

Write: 1465 Wells Stat. Rd., Memphis, Tn. 38108

duced into the ac distribution system when a neighborhood utility pole is hit. The voltage transients produced can travel into equipment via the house wiring. An obvious solution is to pull the plug, but this is not always convenient and can be forgotten. Protection against these spikes is especially important with solid-state rigs since they do not have the overvoltage capabilities of their tube predecessors. Fortunately, help is available in the form of a voltage-spike-protector device. This unit can be attached to essentially any transformer-type ac equipment. The device is a metal-oxide varistor sold by General Electric (Model GE-MOV) and others. The varistor is a two-lead unit that is attached across the transformer primary winding and breaks down to a low resistance in the presence of a large-surge voltage. The action happens very quickly (several microseconds) and shunts the spike across the transformer primary and prevents damage from occuring.

A Closing Note

Well, there you have the basics of how lightning develops and what can be done to minimize its occurrence and effects. Total protection cannot be ensured unless each piece of equipment is isolated from the antenna and the ac mains. Unfortunately, this is not always possible. However, the techniques presented in this article are simple to apply and will provide a significant measure of protection for your equipment. ■

References

1. *Lightning Protection of Aircraft*, NASA publication 1008, F.A. Fisher and J.A. Plumer, 1977.
2. *Lightning Protection*, R.H. Golde, Chemical Publishing, 1973, pp. 9-23.

apple* TERMINALL

$499.00

Simplicity of Operation — Superior Performance
What are you waiting for? THIS IS THE WAY TO GO

TERMINALL now available for APPLE II ! TERMINALL T2 is a hardware and software system which converts your Apple II computer into a state of the art communications terminal. Simply insert the interface card into any available card slot (1-7) in your APPLE, then plug the attached cables into your radio.

Simplicity. TERMINALL was designed from the outset to be easy to connect to your radio and easy to use. Plug into your receiver headphone jack and copy Morse Code or radioteletype (RTTY). Plug into your CW key jack and send Morse Code. Attach a microphone connector and send Baudot or ASCII RTTY using audio tones (AFSK). That's all there is to hooking it up.

Complete software on DOS 3.2 diskette (Muffin to 3.3), assembled and tested hardware, and extensive instruction manual. Requires an APPLE II or APPLE II Plus, 48K and disk.

THE COMMUNICATIONS TERMINAL THAT DOES IT ALL!

The software is loaded into your computer from disk. Enter your callsign and the time and you will start receiving immediately. No settings or adjustments are necessary to receive Morse Code, it's fully automatic -and it works! You may type your message while receiving or transmitting. You will be on the air, receiving and transmitting in any mode, in minutes. As we said, TERMINALL is simple.

- TERMINALL has the RTTY terminal unit - demod and AFSK - built in. This results in a lower total cost.
- **Fantastic Morse reception.** Six stage active filter demodulator copies the weak ones. Auto adaptive Morse algorithm copies the sloppy ones. Received code speed displayed on status line.
- **Outstanding documentation.** Professionally written, 90 page user manual contains step-by-step instructions.
- **Built in, separate, multi-stage active filter RTTY and CW demodulators.** No phase lock loops. RTTY demodulator has 170 and either 425 or 850 Hz shift - keyboard selectable - and uses either the panel meter or scope outputs for easy tuning. Copy the weak ones. Copy the noisy ones. Copy the fading ones.
- **Built in crystal controlled AFSK.** Rock stable for even the most demanding VHF or HF applications. A must on many VHF RTTY repeaters.
- **Built in 110 or 220** volt AC power supply.
- **Built in parallel printer driver software.** Simply attach a parallel ASCII printer (e.g. the EPSON MX-80) to your printer port to obtain hardcopy in all modes.
- **Multi level displays** - allows examining and editing of historical text. Word wrapping, word mode editing, diddle, ignore carriage returns, user programmable end of line sequence, adjustable carriage width, multi user - defined WRU, transmit delay (fixed, none or auto adaptive), break mode and more!
- **The all-in-one TERMINALL** design makes it great for use on HF or VHF Ham, Commercial, SWL or MARS! SWL's: TERMINALL may be jumpered for either 425 or 850 Hz reception to copy news and weather services.

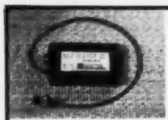
We Discount EPSON Printers. Call Now!

MACROTRONICS, inc.®
1125 N. Golden State Blvd.
Turlock, California 95380

✓44

C.O.D.

(209) 667-2888 or 634-8888
15 DAY MONEY BACK TRIAL PERIOD
We continue to experience telephone difficulties
PLEASE KEEP TRYING
1 Yr. Parts and Labor limited Warranty
*Registered trademark of Apple Computer Inc.



BEEPER III

The Professional Touch Comes To Amateur Radio

See our review in the Aug-81 Issue of 73 Magazine. Add "The Beep" to your transceiver!

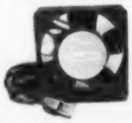
BP-3A	Complete with case, cable, Standard 4-pin connectors	39.95 pp
BP-3B	As above except without connectors. Add your own.	36.95 pp
BP-3C	Circuit-board version for custom installation.	29.95 pp

AD-3

Real-World Apple® Interface Card

A/D, D/A Conversions, 16 IO Ports, 2 Programmable Timers. With Diskette, Ribbon Cables, Manual.
$199 pp

Equipment Fans



Factory Fresh
From $22.30!
Write for a list!

Dealer Inquiries Invited. All Items Postpaid in U.S. Ohio Residents add 6% Sales Tax. Apple is a TM of Apple Computer, Inc.

✓85

FAXSCAN INC.

3148 Dorf Drive • Dayton, Ohio 45418

TM

THE AUTEK "QRM ELIMINATOR"

Autek Research
QF-1A SSB/CW/AM FILTER
AUX. NOTCH FREQ.
NOTCH PEAK
LOWPASS HP
SELECTIVITY
NOTCH
FREQUENCY
AC ON
OFF (BY PASS)

Model QF-1A For SSB & CW $73.00

115 VAC supply built-in. Filter by-passed when off.

Auxiliary Notch rejects 80 to 11,000 Hz! Covers signals other notches can't touch.

Four main filter modes for any QRM situation.

Continuously variable main selectivity (to an incredible 20 Hz!)

Continuously variable main frequency. (250 to 2500 Hz)

AUTEK pioneered the ACTIVE AUDIO FILTER back in 1972. Today, we're still the engineering leader. Our new QF-1A is the latest example. It's INFINITELY VARIABLE. You vary selectivity 100:1 and frequency over the entire usable audio range. This lets you reject whistles with dual notches (to 70 dB), or reject SSB hiss and splatter with a fully adjustable lowpass plus aux. notch. Imagine what the NARROWEST CW FILTER MADE will due to QRM! HP rejects low frequencies. Skirts exceed 80 dB. 1 watt speaker amp. Built-in 115 VAC supply. 6½x5x2½. Two-tone grey styling.

Even latest rigs include only a fraction of the QF-1A selectivity. Yet it hooks up in minutes to ANY rig--Yaesu, Kenwood, Drake, Swan, Atlas, Tempo, Heath, Collins, Ten-Tec, etc. Just plug it into your phone jack and connect spkr. or phones to the output. Join the thousands of owners who now hear stations they couldn't copy without a QF-1A! It really works!

WORLDS RECORD KEYER. OVER 4000 DX QSO'S IN 2 DAYS!

Model MK-1 Keyer $104.50

Probably the most popular "professional" contest keyer in use, yet most owners are casual CW operators or novices. After a few minutes, you'll see how memory revolutionizes your CW operation! Just start sending and record your CQ, name, QTH, etc. in seconds. 1024 bits stores about 100 characters (letters, numbers). Playback at any speed. Dot/dash memories, triggered clock, repeat, combine, 5 to 50+ WPM, built-in monitor and 115 VAC supply. Works with any paddle. Sit back and relax while your MK-1 calls CQ and handles standard exchanges!

Optional memory expander (ME-1) expands any MK-1 to 400 characters. ME-1 factory installed $35. Owner installed, only $25. Add more memory now or later!

Autek Research
BOX 302S
ODESSA, FLORIDA 33556 • (813) 920-4349

NO LONG DELAYS. WE SHIP 95% OF ORDERS FROM STOCK

We sell only factory direct. No dealer markup in our price. Order with check, M.O., VISA, MC. We pay shipping in 48 states. Add 4% tax in Fla. Add $3 to Canada, Hi., Ak. Add $18 each elsewhere. (Shipped air.)

GOTHAM ANTENNAS

master charge
VISA

(305) 294-2033

✓417

SMALL LOT TRAP DIPOLES

MODEL	BANDS	LGTH	PRICE
TSL 8040	80.40	78'	$49.95
TSL 4020	40.20.15	40'	$47.95

SMALL LOT SHORTENED DIPOLES

SL-8010	80.40.20.15.10	75'	$59.95
SL-160	160	130'	$36.95
SL-80	80	63'	$35.95
SL-40	40.15	33'	$34.95

FULL SIZE PARALLEL DIPOLES

FPD-8010	80.40.20.15.10	130'	$49.95
FPD-4010	40.20.15.10	63'	$44.95

NEW! PORTABLE VERTICAL! IDEAL FOR APARTMENTS. CAMPING. TRAILERS!

Folds to 5' Package. No Radials. Required. Fully Assembled. Full Legal Limit. 1:1 VSWR

MODEL	BANDS	HGHT	PRICE
PV-8010	80-10	13'	$59.95

PROVEN DESIGN · GOTHAM ALL BAND VERTICALS

V-160	160.80.40.20.15.10.6	23'	$39.95
V-80	80.40.20 15.10.6	23'	$37.95
V-40	40.20.15.10.6	23'	$35.95

FAMOUS GOTHAM QUADS
2 Elements — 3 Bands Complete $119.95
CHAMPIONSHIP GOTHAM BEAMS
Full Size Complete from $79.95
DEALER INQUIRIES INVITED
CALL OR SEND LARGE SASE FOR CATALOG. Shipping: Dipoles & Verticals $2.50 USA:$7.00 Canada: $5.00 FPO, APO Beams & Quads Shipped UPS or Freight Collect. Fla. add 4% Sales Tax

1415 First St. • Key West, FL 33040

MIRAGE MIRAGE MIRAGE COMMUNICATIONS EQUIPMENT, INC.

5 YEAR WARRANTY
Parts and Labor
1 yr. on RF Power Transistors

Peak Reading Watt/SWR Meters

MP1 — HF
1.8 to 30 mhz
25, 200, 2000 watts ± 5%
$119.95

MP2 — VHF
50 to 200 mhz
50, 500, 1500 watts ± 5%
$119.95

2 Meter "All Mode" Amplifiers
FM - SSB - CW

B108	10 W. in	80 W. out	$179.95
B1016	10 W. in	160 W. out	279.95
B3016	30 W. in	160 W. out	239.95
B23	2 W. in	30 W. out	89.95

These amplifiers, except B23, have built in RX preamps. The B108 and B1016 may be used with HTs or transceivers. They will key with 1 Watt input.

RC-1 Remote Control $24.95

New!! D1010 430-450 Amplifier
"ALL MODE" FM-SSB-CW-ATV

10 W. in — 100+ W. out
2 W. in — 25+ W. out
$319.95

SEE YOUR NEAREST DEALER FOR INFORMATION
MIRAGE COMM. EQUIP., INC. • P.O. BOX 1393 • GILROY, CA 95020 • (408) 847-1857

Stormy Weather

—to be forewarned is to be forearmed

David J. Brown W9CGI
RR 5, Box 39
Noblesville IN 46060

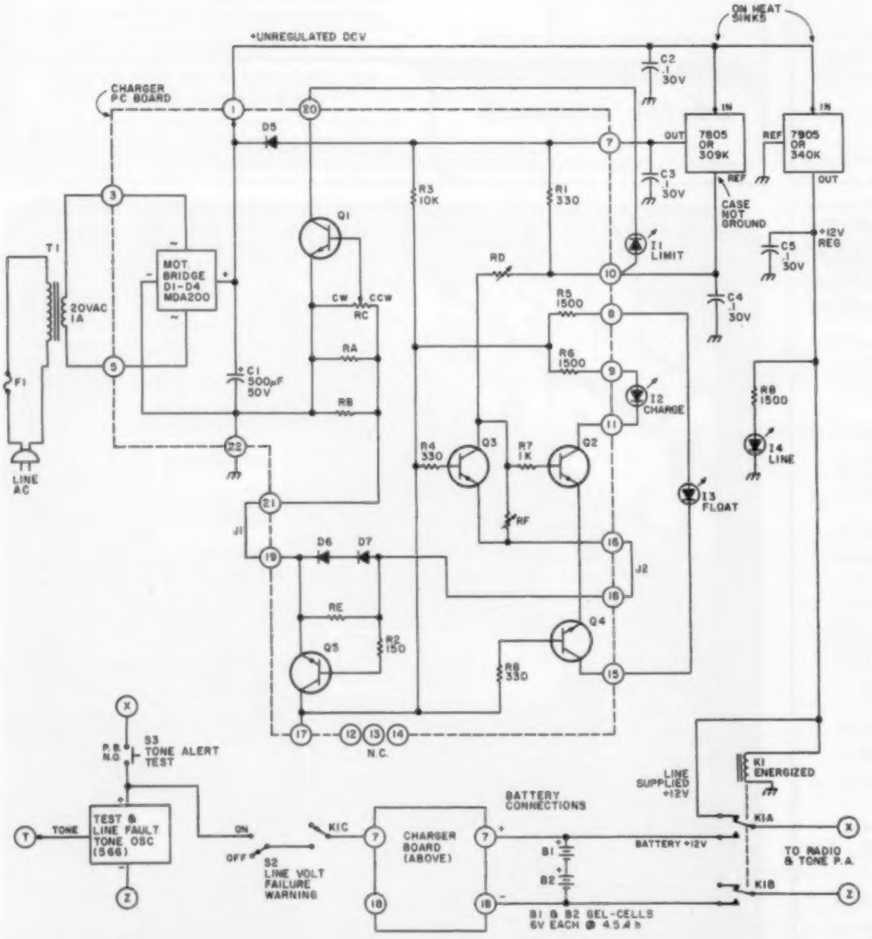

+UNREGULATED DCV
ON HEAT SINKS
CHARGER PC BOARD
D5
R3 10K
R1 330
7805 OR 309K
IN
OUT
REF
CASE NOT GROUND
7905 OR 340K
IN
REF
OUT
C2 .1 30V
C3 .1 30V
C4 .1 30V
C5 .1 30V
+12V REG
T1
20VAC 1A
F1
LINE AC
MOT. BRIDGE D1-D4 MDA200
C1 500μF 50V
Q1
CW
CCW
RC
RA
RB
RD
I1 LIMIT
R5 1500
R6 1500
I2 CHARGE
R8 1500
I4 LINE
R4 330
Q3
R7 1K
Q2
I3 FLOAT
RF
J1
J2
D6
D7
RE
Q5
R2 150
Q4
R8 330
N.C.
P.B. N.O.
S3 TONE ALERT TEST
TONE
TEST & LINE FAULT TONE OSC (566)
ON
OFF
S2 LINE VOLT FAILURE WARNING
K1C
CHARGER BOARD (ABOVE)
BATTERY CONNECTIONS
B1
B2
B1 & B2 GEL-CELLS 6V EACH @ 4.5 Ah
BATTERY +12V
LINE SUPPLIED +12V
K1 ENERGIZED
K1A
K1B
TO RADIO & TONE P.A.
X
Z
T

Fig. 1. Power pack: ac operation, dc battery and charging, and the automatic switching between ac and dc.

You say the storm just turned your yard and basement into Lake Michigan? The swing set just tipped over into your picture window, and the St. Bernard got blown halfway through the fence—what's left of it? Is there something going 'round and 'round and marching down your street with your nice new car bouncing along on its top? Is that what's troubling you, Bunky?

The heavens truly opened up and delivered their wrath, but at least you and the family all made it through in one piece! Or maybe you have seen it happen to others, and it just came too close to you for comfort. Well, then, have I got something for you! No longer do you have to keep one eye on the sky, one foot in the basement, one hand on the most valuable thing you own, an ear screwed into the radio, and then still try to work and go around and about your business in that position. That is like the old shoulder to the wheel, eye on the ball, etc., and-try-to-work-in-that-position joke. Why not let a very special monitor do the worry and watching, courtesy of the National Weather Service VHF radio broadcasts?

Should the "very special" comment lead you to believe my idea is also quite expensive like the special receivers used in schools for weather warnings, don't let it! It is just not true. The "special" refers to the dedicated and reliable job my unit does and some of the easy and inexpensive ways to accomplish really fantastic results.

The Source of Warning

The National Weather Service operates a weather-warning system of VHF stations throughout the country. They are located in nearly every major-size city, near any sizable body of water, and in some remote places you would never believe. A phone call to your local radio/TV station, a note to the National Weather Service (NWS), or punching up their frequency on a monitor will tell you quickly if one is nearby enough for you to use it. The frequencies in use are 162.400, 162.475, and 162.550 MHz, one frequency to any given area.

Our station in the Indianapolis area is on 162.550 MHz and serves a much wider territory of central Indiana than I think even NWS planned on. The transmissions are narrowband FM (approximately 5 to 7 kHz audio) and easily programmed into most of the available monitor/scanners.

A word about scanners, though. I have had Indy NWS programmed into my Bearcat 250 scanner since I first learned of it. I live on a farm, out in the open, and am, in a word, vulnerable! However, if you want the scanner to still scan, you must lock out the NWS channel except when you want to listen to it. Unfortunately, with it locked out, you may miss a weather alert/warning call when you need it most. You could be asleep, scanning 2m or the police, etc. I am not knocking a scanner or monitor for occasional NWS channel use, but to tie one up on it for serious warning and safety use is an expensive and silly approach.

Storms come up far too fast in the southwest and midwest, unlike, say, a hurricane approaching Florida or Texas. There were days of warning on recent hurricanes. In the midwest, when two air masses get together, we often get some hair-raising *minutes* of a tornado warning.

Solutions—Save Our Souls (. . . — — — . . .)

There are, fortunately, several answers to the problem. Proper equipment choice, the way NWS handles real alert conditions, and what you may already have on hand or be able to get cheap are all that I want to tie together in this article.

First, the service was not chosen in the 162-MHz region arbitrarily. It was originally a marine weather service and that fits the frequency range of most of the marine VHF radios nicely. To be useful, it is a 24-hours-a-day, 7-days-a-week continuous broadcast of weather and related information to serve those marine commercial and private boat owner/operators.

Downtime is for fixing a failure or preventative maintenance only, and most stations, if not all by now, have back-up gear to cover those times when the main transmitter is off the air. There is *no* receiving on those frequencies by NWS, and *please* do not transmit anything there! When a real danger exists in the station's area or approaching it, such as severe storms or a tornado watch or warning, the NWS station comes on with a live broadcast immediately.

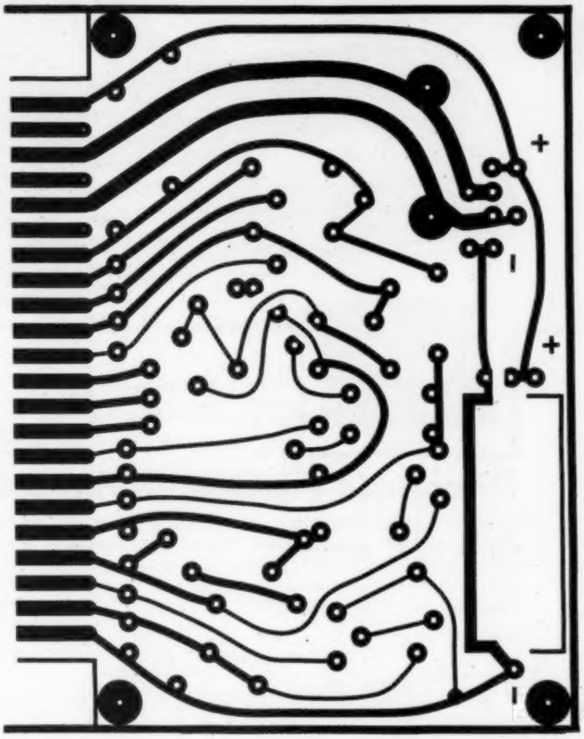


Fig. 2. PC board layout for power source.

These "alert" broadcasts are preceded by 15 to 20 seconds of continuous 1050-Hz audio tone. That is the trick to making my receiver idea work, without going insane listening to the all-day and all-night-long broadcasts. They are loop-taped, about 1 minute long, and updated about once per hour or as needed. Over and over, and believe me, it goes on, and on, and on! You could become an NWS announcer word-for-word after about 10 passes of that same information.

Since they use that 1050-Hz tone before every live broadcast of an "alert/warning" nature, I decided to detect it, open a receiver's audio and find out what all the commotion was about, and still not turn into a babbling idiot! So can you, and very inexpensively these days. I have shown and will explain in detail several ways to go about doing this from several different approaches. Then you can have your very own protection and enjoy a valuable and free service. This is not like snitching the HBO or cable services. NWS *wants* you to use this service. You could end up saving property damage to yourself and others, lessen personal injuries caused by these storms, and quite realistically protect life itself—and it could be your own. An ounce of prevention—a minute of warning—same story!

Power Sources

I have outlined a way to

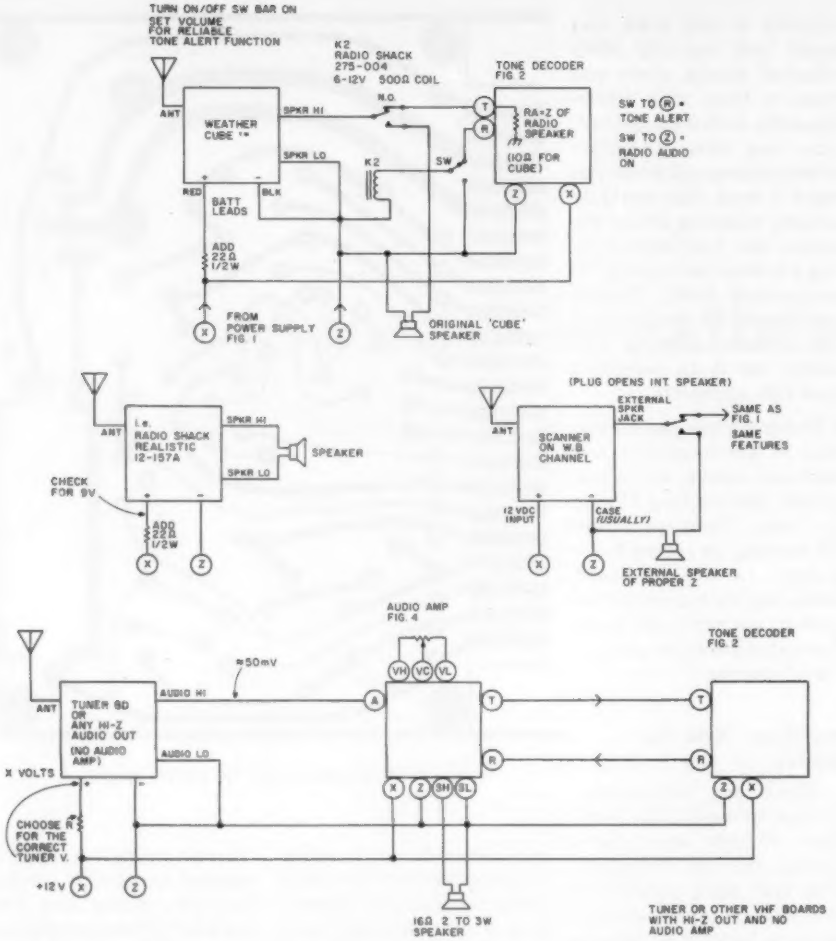

TURN ON/OFF SW BAR ON
SET VOLUME
FOR RELIABLE
TONE ALERT FUNCTION
K2
RADIO SHACK
275-004
6-12V 500Ω COIL
TONE DECODER
FIG. 2
ANT
WEATHER
CUBE ™
SPKR HI
SPKR LO
N.O.
K2
SW
T
R
RA=Z OF
RADIO
SPEAKER
(10Ω FOR
CUBE)
SW TO Ⓡ =
TONE ALERT
SW TO Ⓩ =
RADIO AUDIO
ON
RED
BLK
BATT
LEADS
ADD
22Ω
1/2W
Z
X
FROM
POWER SUPPLY
FIG. 1
ORIGINAL 'CUBE'
SPEAKER
ANT
i.e.
RADIO SHACK
REALISTIC
12-157A
SPKR HI
SPKR LO
SPEAKER
CHECK
FOR 9V
ADD
22Ω
1/2W
(PLUG OPENS INT SPEAKER)
EXTERNAL
SPKR
JACK
SAME AS
FIG. 1
SAME
FEATURES
ANT
SCANNER
ON W.B.
CHANNEL
12 VDC
INPUT
CASE
(USUALLY)
EXTERNAL SPEAKER
OF PROPER Z
AUDIO AMP
FIG. 4
VH
VC
VL
TONE DECODER
FIG. 2
≈50mV
ANT
TUNER BD
OR
ANY HI-Z
AUDIO OUT
(NO AUDIO
AMP)
AUDIO HI
AUDIO LO
A
T
R
SH
SL
X VOLTS
CHOOSE R
FOR THE
CORRECT
TUNER V.
+12 V
16Ω 2 TO 3W
SPEAKER
TUNER OR OTHER VHF BOARDS
WITH HI-Z OUT AND NO
AUDIO AMP

Fig. 3. Configurations: What can be put into service, uses, facts, and ideas. Configuration 1: Low-Z (speaker) radio audio, tone-alert feature, and power line failure feature. Configuration 2: Low-Z (speaker) radio audio, tone-alert built into radio, and power line failure feature. Configuration 3: Scanner use, e.g., Bearcat 101 or 250. Configuration 4: Tuner or other VHF boards with high-Z out and no audio amp. Configuration 5: Can be used like configurations 1 or 3 with 2m FM rig to monitor for tone calls only. Configuration 6: Same as 5, only WWV Time-cube and the tones given on the hour/half-hour/minute for contest or schedule operations. Configuration 7: Same as 5, with converted CB radio on 10m for local net or rag-chew call-up or messages. Configuration 8: Same as 5, with unconverted CB and emergency call-up, e.g., REACT, WTHR, disaster.

be warned of danger, but the danger is storms and with that goes wind, hail, ice, snow, tornadoes—and sooner or later loss of power from the ac mains. If lightning knocks a pole down up the road and your power goes off at the leading edge of the storm, and *then* the tornado comes dancing up to your doorstep, the alert monitor is not going to warn anybody with the juice off!

Any really useful monitor *must* have a standby power source and switch to it automatically. It should use rechargeable, rugged, sealed batteries like those I have shown as Gel/Cells in Fig. 1, B1 and B2. This figure describes my power system and the switching needed. I admittedly overkilled when it came to the Amp-hour rating and capacity of the batteries I used. I wanted to be sure if the power went off in the early evening, without having to forever eagle-eye the monitor, it would continue running on batteries—for days if need be. Further, a 12-volt jack on the back connected across (x) and (z) allows me to run the Bearcat 250 on 12 V dc all the time, by using the Bearcat mobile power input connection. In a real bind, I can even plug in my HW-202 2m FM rig with rubber ducky for full 2m operation. Note: The regulator supplying point (x) will *not* supply the Heathkit 2-Ampere transmit load when the power source is operational in ac mode, but then I have a Heathkit ac power pack for that. I am referring to real emergency conditions and battery operation only. The source in ac mode (point x) will supply 1 Ampere maximum.

In order to get the project into use as quickly as possible, I have "borrowed" heavily on others' designs that I knew worked. I have added a PC board if they did not, modified some circuits to do my bidding instead of the original author's, and created a lash-up that works and works well. I will try to credit the original authors and sources as I come to them, and I will point out my changes.

For opening credits, the battery charger complete with a very nice floating charge system for always live batteries is courtesy of Don Johnson WB6MXD via *73 Magazine*, August, 1980. I have had my alert monitor system for some time now, but the change to Don's system with float feature has really added dimension to it. It made good sense and worked right off, but it had no PC board. I added that as a plug-in or wire-in PC board and it is Fig. 2.

The batteries, as I said, are much more capable than the monitor requires. There is another good reason for staying with all that "grunt" capability, and that is that the batteries are readily available in the form of the replacement batteries for portable TV sets. One such source is RCA dealers or their Parts and Accessories Department (RCA part number 1437888-501—one 6-volt pack, i.e., B1 or B2). 12 volts requires two of these packs.

Copy RTTY, ASCII and Morse from the palm of your hand.

MINIREADER
Kantronics Mini-Reader

Have you waited to get into code reading until you found out what this latest fad was about? You can stop waiting, because it's no longer a fad.

Amateurs everywhere are tossing the gigantic clanking monsters of yesteryear that once performed the job of reading radioteletype. They are trading them in for state-of-the-art code-reading devices that are incredibly small, noiseless if desired and infinitely more versatile than their antique predecessors.

Kantronics, the leader in code-reading development, has just introduced the latest and most-advanced breakthrough in the copying of Morse code, radioteletype and ASCII computer language.

The **Kantronics Mini-Reader** reads all three types of code, displays code speed, keeps a 24-hour clock, acts as a radioteletype demodulator and reads all of its decoded information out on a traveling display of 10 easy-to-read characters. It is so compact that it fits in a hand-held, calculator-size enclosure.

At **$289.95**, the **Mini-Reader** outperforms anything within another $400 of its price range.

Call or visit your Authorized Kantronics Dealer now to find out what the latest in technology has done to code-reading.

Kantronics
(913) 842-7745
1202 E. 23rd Street
Lawrence, Kansas 66044

Model 173DM
Dual, independent clocks/Solid walnut case/
Functional and beautiful
$69.95 (plus $3.00 shipping)

19:49
PM 2:49
Benjamin Michael

Benjamin Michael
21:54

Model 173B
Internal backlight/Aluminum
and Poly case/Portable
$34.95 (plus $3.00 shipping)

Independent Military Option

Military time format clocks by **Benjamin Michael**. Independent of power lines these units are energy efficient, secure, and free to provide accurate quartz controlled time in any setting. Used by the Military and U.S. government agencies as well as many municipal law enforcement and public safety departments, these units won't quit just because commercial power did.

Exercise your independent military option now.

✓420

Benjamin Michael Industries
INC.

Canadian distributer:
Ham Radio Atlantic
PO Box 755
St. John, NB E2L 4B3

65 E. Palatine Road
Prospect Heights, IL 60070
312-459-5760

VISA MasterCard

ISO-440

FOR UNDISPUTED PERFORMANCE, EASY ASSEMBLY, VERY BROADBAND, LOW SWR, RUGGED MECHANICAL DESIGN . . . TRY THE AEA ISOPOLE™ ANTENNA FOR YOUR NEXT VHF OR UHF BASE STATION INSTALLATION

ISO-144
ISO-220

MAST NOT INCLUDED

FOR AEA ANTENNAS
OR OTHER AEA PRODUCTS,
CALL OR VISIT:

AEA
Brings you the Breakthrough!

CALL TOLL FREE 1-800-854-6046

HAM RADIO OUTLET

(714) 761-3033 (213) 860-2040 (415) 342-5757
(415) 451-5757 (714) 560-4900 (213) 988-2212

✓See List of Advertisers on page 130

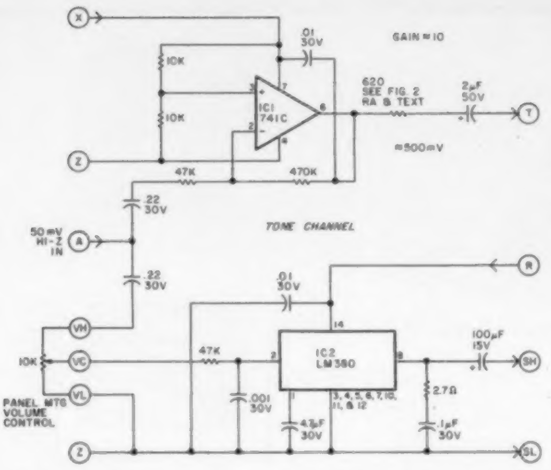

X
.01
30V
GAIN ≈ 10
10K
10K
IC1
741C
3
2
7
6
4
620
SEE FIG. 2
RA & TEXT
2μF
50V
T
≈500mV
Z
47K
470K
.22
30V
TONE CHANNEL
50mV
HI-Z
IN
A
.22
30V
R
.01
30V
VH
14
100μF
15V
10K
VC
47K
2
IC2
LM380
8
SH
VL
PANEL MTG
VOLUME
CONTROL
.001
30V
1
4.7μF
30V
3, 4, 5, 6, 7, 10,
11, & 12
2.7Ω
.1μF
30V
Z
SL

Fig. 4. Audio amplifiers: Using the total unit with tuners that have high-Z audio available and/or no audio output stage(s) to boost audio level for speaker.

It is a plastic package containing 3 cells, has leads of about 6″ coming out with a rather standard molex™ 2-pin connector termination (male plugs, female pins), and the leads are long enough to change to any connector of your choice. For information sake, they are made by Gates Battery so their brand name 6 V @ 4.5 Ah will do fine also. The Globe-Union #1245 also is the same.

Control and Switching

Fig. 1 shows all the switching to automatically drop the monitor to battery upon an ac line failure, sound a 1050-Hz tone and bring up the NWS audio if desired, and even automatically switch back to the ac mains when power has been restored. At that time the batteries begin recharging, and when back up to full charge, switch to the floating charge state to maintain full capacity for the next downtime failure.

LED indicators keep you constantly aware of status, so I recommend you mount them on the front panel with the speaker and volume control. The NWS-ON/Alert position switch can go there or on the rear panel, as you choose. After the tone brings up receiver audio for a fixed period, to go on listening, that switch must be changed from the normal alert monitor position to NWS, so act accordingly with your layout. My LED recommendations are: red for I1 to show limit current, yellow or amber for I2 to show normal charging, green for I3 to show the float/standby condition, and whatever fourth color you can come up with for the remaining I4 to show that the monitor is on and in the ac mode.

All circuits (LED, relay, audio, etc.) are arranged to allow minimum current drain in the battery service mode, i.e., all LEDs are off, relay K1 is de-energized, and audio is off until alert tone is received unless in NWS position. I have changed very little of Fig. 1 from Don's original except the added 12-V dc regulator as an ac-mode power source and switching relay K1. If you do not want the tone warning on ac failure but only for the radio to go on quietly monitoring NWS on battery power, K1 can be just a DPDT relay with a 12-V dc coil, no K1c contacts, and K1a and K1b contacts rated at 1 Ampere. S2 (warning on/off) can then be eliminated. I would advise you to wire it in and just put it to "off"; adding it costs so little. You won't know how useful it is until you have tried it for awhile. In any case, keep the alert test switch, S3, as you still want to be able to test the tone-alert system from time to time with an internal 1050-Hz tone. 20 seconds or so on S3 should open up receiver audio, whether the NWS carrier is present or not.

Automation—The Tone Decoder

This circuit is also borrowed, though modified, and belongs to Robert Lloyd, from *Popular Electronics,* May, 1976 (I read 'em all!). The original cir-

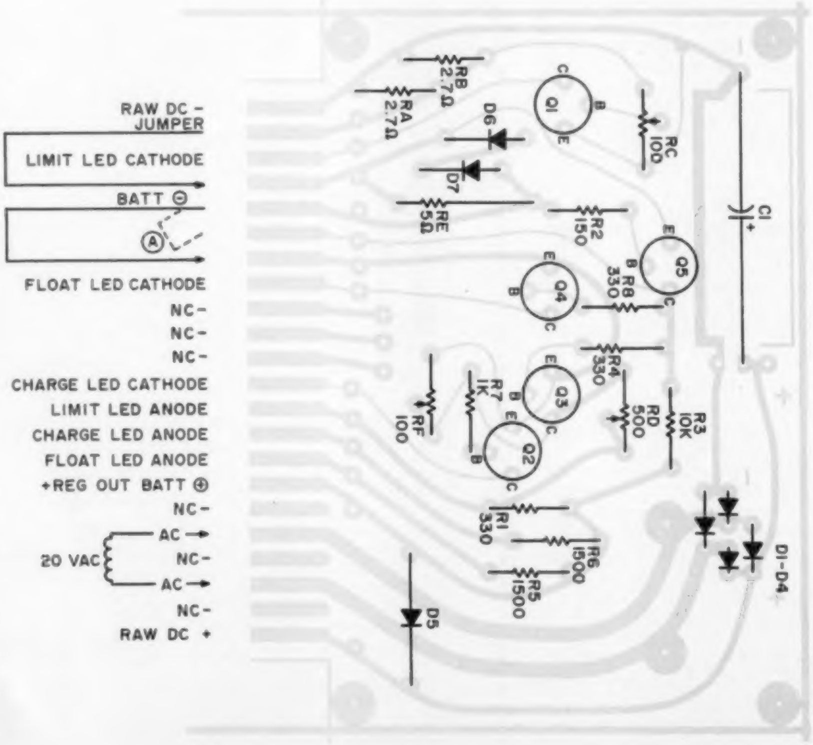

RAW DC –
JUMPER
LIMIT LED CATHODE
BATT ⊖
A
FLOAT LED CATHODE
NC –
NC –
NC –
CHARGE LED CATHODE
LIMIT LED ANODE
CHARGE LED ANODE
FLOAT LED ANODE
+REG OUT BATT ⊕
NC –
20 VAC
AC →
NC –
AC →
NC –
RAW DC +
RB
2.7Ω
RA
2.7Ω
D6
C
Q1
B
E
RC
100
D7
RE
5Ω
R2
150
C1
+
E
Q5
B
C
R8
330
E
Q4
B
C
R4
330
E
Q3
B
C
R7
1K
E
Q2
B
C
RF
100
RD
500
R3
10K
R1
330
R6
1500
R5
1500
D5
D1-D4

Fig. 5. Component location for power supply board.

The HAM SHACK

808 N. Main • Evansville, IN 47711

TEN-TEC	
546 Omni-C Xcvr	$1050
580 Delta	740
525 Argosy	480
229 2KW Antenna Tuner	225
227 200W Antenna Tuner	72
234 Speech Processor	120
243 Remote VFO-Omni	169
217, 218, 219 or 220 IF Filters	49
215P Microphone	25
SANTEC	
ST 144/µP 2m Hand-Held	299
AEA MBA Reader	270
AZDEN PCS-300 2m Hand Held	call
BUTTERNUT HF6V Vertical	109
CUBIC Astro 103	1175
HAL CT2100	695
HY-GAIN TH7 DX	call
HY-GAIN HAM IV Rotator	169
KLM KT34A	315
ICOM 25A	309
ICOM 730	700
MFJ 496 Keyboard	290
MIRAGE B108	155
VoCom Pocket Power	195

812-422-0231 449

MON-FRI 9AM-6PM • SAT 9AM-3PM

Write for our new and used equipment list

THE LAST WORD IN READERS

THE NEW AEA MBA-RO

FEATURES:

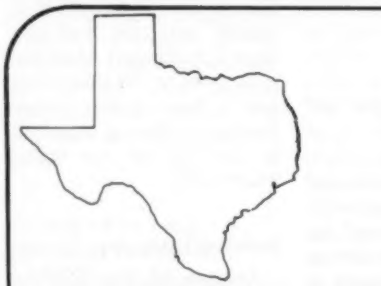
- 32 CHARACTERS FOR EASY HIGH SPEED COPY OF MORSE
- ASCII and BAUDOT RTTY
- NO RECEIVER MODIFICATION NECESSARY
- INSTANT SPEED TRACKING FOR MORSE CODE OVER WIDE SPEED RANGE FROM 2 TO 99 WPM
- OPERATES FROM 12 V.D.C.

For AEA Readers or other AEA Products, call or visit:

AEA

Brings you the Breakthrough!

Britt's 2-Way Radio
Sales & Service
2508 Atlanta Street
Smyrna, Ga. 30080
(404) 432-8006



Universal Communications
A DIVISION OF INNOVATIVE LABS, INC.
P.O. BOX 339
ARLINGTON, TEXAS 76004-0339

UC

SUPERVERTER I.................... $99.95
The ultimate in converter technology! Dual-stage selective preamp, mixer, i.f. amplifier and no-drift crystal-controlled oscillator. We recommend this unit **for experienced kit builders.** 12v Stationary Power Supply . . . $24.95 for Superverter I.

SELECTIVE PREAMP............................$39.00
This new unit is not like other wideband preamps. Experienced kit builders can easily add this unit to our existing boards or to other manufacturers' boards to improve overall performance.

2300 MHZ CONVERTER KIT.......... $35.00
Complete with PC board, parts and 10-page instruction book.

VARIABLE POWER SUPPLY......... $24.95
Complete kit includes all components for working unit, including deluxe box and overlays.

DISK YAGI ANTENNA............... $25.00
Complete kit with PVC and mounting bracket. Stronger than loop yagi, and equal in gain.

4-FOOT DISH ANTENNA............ $54.95
Overall 25 dB gain. Partial assembly required. Shipped UPS (ground) only.

DL-2000 SATELLITE RECEIVER..... $749.95
Fully assembled receiver—this is not a kit.

VIDEO STABILIZER...............................$55.00

TERMS: COD, Money Order, Bank Cards
HOURS: 8:30-4:30 CDST; MON-FRI (817)-860-1641

Hope to see you in Dayton

Our product may be copied, but the performance is never equalled.

UNIVERSAL COMMUNICATIONS **P.O. BOX 339, ARLINGTON, TX 76004-0339**

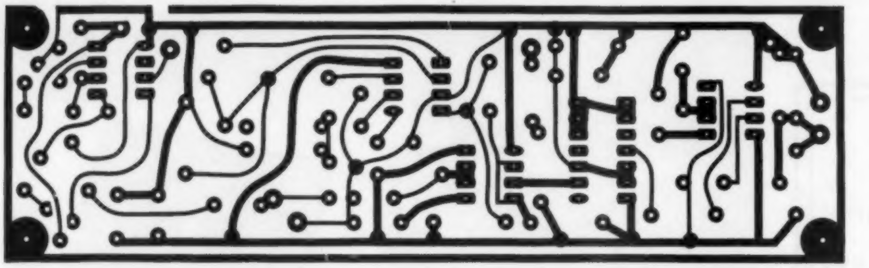


Fig. 6. PC board layout for tone decoder/tone oscillator.

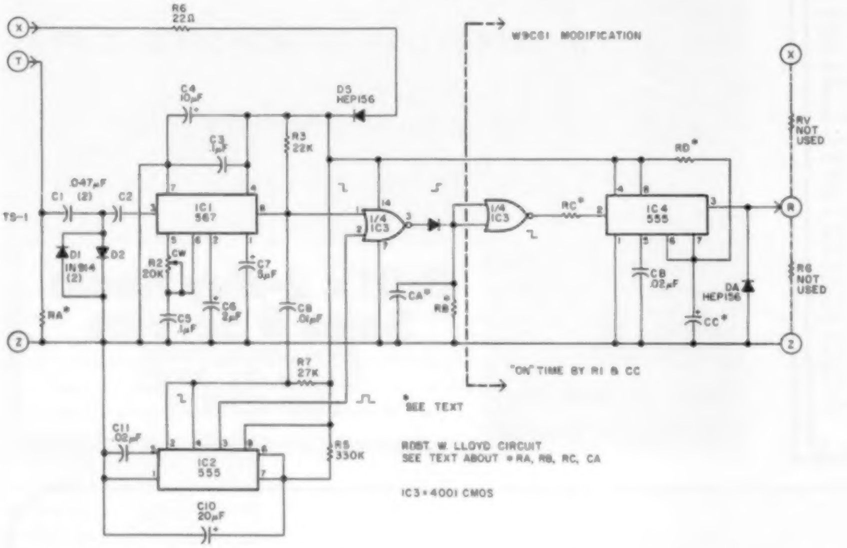

R6
22Ω
X
T
W9CGI MODIFICATION
X
C4
10μF
D5
HEP156
R3
22K
C3
.1μF
RV
NOT
USED
RD*
.047μF
C1 (2) C2
TS-1
IC1
567
1/4
IC3
1/4
IC3
RC*
IC4
555
R
D1
IN914
(2)
D2
R2
20K
CW
C7
5μF
CA*
RB*
C8
.02μF
DA
HEP156
R6
NOT
USED
RA*
C5
.1μF
C6
2μF
C9
.01μF
CC*
Z
Z
R7
27K
"ON" TIME BY R1 & CC
*SEE TEXT
C11
.02μF
IC2
555
R5
330K
ROBT. W. LLOYD CIRCUIT
SEE TEXT ABOUT *RA, RB, RC, CA
IC3 = 4001 CMOS
C10
20μF

Fig. 7. Tone decoder and latch: Detecting the National Weather Service alert tone and holding audio on for a fixed period.

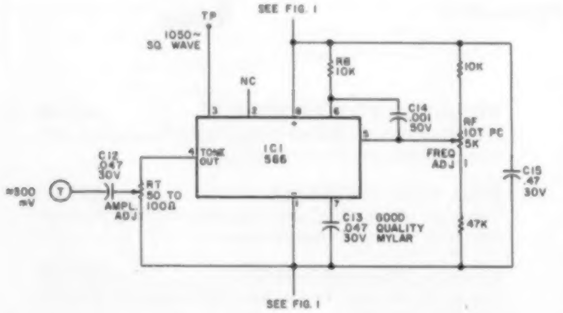

TP
1050~
SQ. WAVE
SEE FIG. 1
NC
R8
10K
10K
C14
.001
50V
RF
10T PC
5K
FREQ
ADJ
TONE
OUT
IC1
566
C12
.047
30V
≈800
mV
T
RT
50 TO
100Ω
AMPL.
ADJ
C15
.47
30V
C13
.047
30V
GOOD
QUALITY
MYLAR
47K
SEE FIG. 1

Fig. 8. Tone oscillator: Testing the tone alert and tone source for alerting the user of an ac failure.

cuit ran a 567 IC as the tone decoder, a 555 IC as an antifalsing device to keep voice in the 1050-Hz range from triggering the monitor audio on, and ¼ of a CMOS 4001 gate to identify the legitimate over-15-second tone by gating the tone decode output (low) and the 555 output (returning to low) to form a high output. Mine is the same up to this point, except Ra is shown as an (*). For the Weathercube™ used with Lloyd's original circuit (Fig. 3, Configuration 1), Ra is 10 Ohms. You will see more in the rest of the configurations for Ra values, but in general, Ra should be equal to the radio's speaker impedance or close to it. Usually from 10 to 47 Ohms works just fine, but try to match speaker Z. If Fig. 4 is used in any configuration, then Ra should be 600 to 620 Ohms to match the tone preamp's output impedance. There was no PC layout with the original on this one either, so I have included mine as Fig. 6. Fig. 6 also has the tone oscillator on it, since one feeds the other anyway, and that makes one less wire for you to hook up.

The modifications did *not* come about from Lloyd's circuit not working— it does. I simply could not locate quickly enough the HEP 320 SCR he used to latch things on after the tone is decoded. My substitutes were not reliable enough, and while mumbling something about local parts suppliers' relationships to the old 4-legged Army pack transportation, I decided I needed one more feature not provided for in his original circuit. Even had I gotten everything working up to here, I had overlooked one small detail in the NWS signal format and schedule.

Remember, I wanted *total* hands-off operation until the real tone alert brought things up. Well, as an added service to the schools and other NWS users, NWS also sends out a *test* tone callup every morning around 10 or 11 o'clock! That meant my perfect system would come on every morning and "serenade" my wife for 8 solid hours until I got home around 6 pm. You know by now, that even if she unplugged it, it would harp on and on. Since I don't wear a hat, my head goes in the door first, and I have grown rather fond of it staying attached to the rest of my body. 'Nuff said!

Building It My Way

Instead of the SCR to latch the system on, I have used another 555 IC set for about 2 minutes. I used another of the 3/4-unused gates in the 4001 to invert the original high-going SCR turn-on pulse to a low-going 555 trigger pulse. Now the monitor comes on for about 2 minutes. If anything interesting is going on, I can throw the switch from alert to NWS-ON and listen for any period of time, returning it to alert when I have finished. This way, even the test alerts only bring the monitor on for 2 minutes, and that I deemed tolerable. My head was safe again!

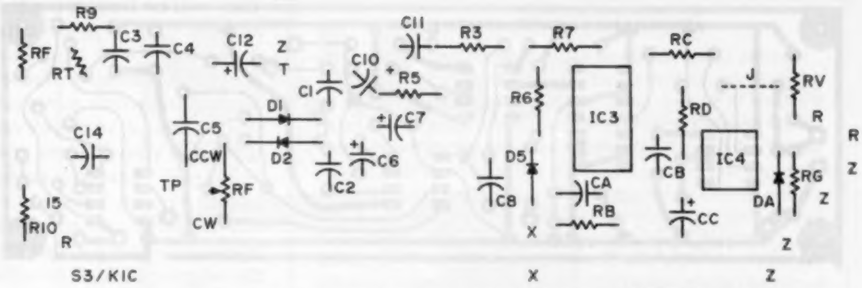


Fig. 9. Component location for tone decoder/tone oscillator board.

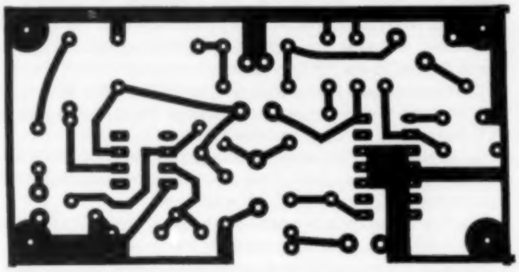


Fig. 10. PC board layout for audio interface.

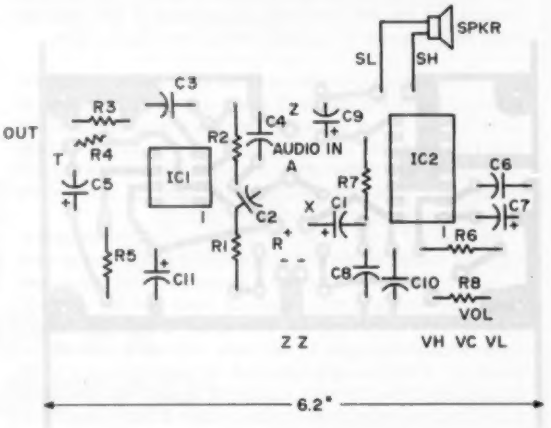


Fig. 11. Component location for audio interface board.

As for the further "see text" items indicated by *, Rc can be from 10k to 1M and still trigger the 555 and not injure the trigger input. It is a safety device to protect the 555 trigger input from attaching directly to the +V rail when high, as the CMOS 4001 device would allow it to do. Keep going up to 1M (or it quits triggering), cut that value in half, and you should be in fine shape from both safety and reliability standpoints.

Ca can be about the original 0.1 uF/30 V, and Rb should start at the original 470 point. Rb and Ca filter out the little glitch that occurs when the 567 tone decoder output goes low on tone. That low causes the 555 anti-falsing device output to go high, but not immediately. That instant that the 567 and 555 outputs are both low would make gate 1 output high, gate 2 output (inverter) low, and falsely trigger the last latch 555 on—a no-no. As long as the filter is big enough to stop that false triggering and not exceed the total normal tone duration, it will do. It is not critical, so try what you have.

Testing—The Tone-Oscillator Function

The tone oscillator is also borrowed, straight from a National Semiconductor Data Manual, June, 1973, for a 566 tone-oscillator IC. The PC layout is mine and is just added onto the input end of the decoder board, Fig. 6, as that's where its output goes, anyway. It is turned on by turning the voltage on and off, either by manual test by pushing the switch (Tone Alert Test, S3, Fig. 1), or by the K1c relay contact to alert you of an ac line failure. The switch, S2, between K1c and the tone oscillator merely lets you include the loss-of-mains feature, but not always use it if you so desire. Don't let the voltage on/off control of the oscillator scare you. Under normal circumstances it is not good practice, but it allows easier control switching here. The monitor tone decoder needs 15 or so seconds to respond, and the oscillator will settle down to its 1050-Hz output in much less than that.

Interface—Making What You Have Work

Fig. 4 is a 2-channel audio circuit, and Fig. 6 is a PC layout for same. It too is "borrowed" from a friend at work, but it is pretty much two data-book circuits on a single PC board. The original intent was to build up the audio from a High-Z source, like a one-IC FM demodulator. One channel (the 741C) builds it up from 50 mV to 500 mV with a 600-Ohm impedance to drive a modulator like that used in a video tape or games unit. The second channel (LM380) builds the power level up to 2 to 3 Watts to drive a speaker. It was ideal for my purpose, and by a minor PC board change to divide the +12-V dc feedpoint into two points, it is perfect. The +12 V dc must go from power source (x) to the (x) of the audio board directly, so the tone amp is always on and working (741C). To silence the audio output without having to resort to things like breaking the poshi lead of the speaker with a relay (see Fig. 3, Configuration 1, relay K2), the +12 V dc to the audio amp (380) is broken instead. This is done by connecting power source (x) to audio board (R). Just when and how this is done is covered in the Configurations section and Fig. 3.

Configurations—Endless Ideas

Obviously, there are many ways to attack the problem once past the highly recommended Fig. 1 power source. The first step is what you are going to use to get the VHF down to audio—the monitor radio part. I have a few tips on that part that can save bucks.

First, don't overlook where you are and where the station is. A nearby station does not take a $300 receiver sensitivity to hear it. Even if you are a bit out from the station, don't overlook using "cropped-down" channel 2 through 6 VHF TV antennas of the discount store variety or a cropped-down broadcast FM or even 2m antenna.

ALIGNMENT and ADJUSTMENT

See the power supply in Fig. 1. With no battery attached, adjust R2 for the floating voltage of 13.5 V dc (2.25 volts/cell × 6 cells = 13.5 volts). Next, adjust the full-charge voltage by jumpering point A to the emitter of Q3 and adjusting R3 for an output voltage of 14.4 V dc (2.4 volts/cell × 6 cells = 14.4 V.

The current limit control, R 4, is a little more difficult to set. I set the control to full counterclockwise, then connected the battery, with an ammeter in series with the battery, to the charger. A partially discharged Gel/Cell will draw in excess of the maximum allowable charge current from an unregulated supply, so all you need to do is turn the limit control until the meter indicates 700 mA.

The charger is ready for service. Connect the Gel/Cell and watch the lights. The yellow LED indicates the battery is charging. If the red LED also is on, you know that the charger is limiting and you can expect the terminal voltage to be below 14.4 volts. As the fully-charged condition nears, the red LED will go out and the voltage will reach 14.4 volts. When full charge is reached (charge current below 100 mA), the yellow LED will go out as the green one comes on.

No alignment or adjustment is required for the audio interface in Fig. 4 beyond setting the user (panel-mounted) volume control for the volume level you want.

See Fig. 7, the tone decoder. For testing, start with the ICs out and the circuit not connected to the receiver.

Install *IC1* in its socket and connect a dc voltmeter between pin 8 and ground (positive side to pin 8). Turn on the dc power and note that the voltmeter indicates close to the supply voltage. Connect an audio signal generator ground to the circuit ground and the hot side to the W terminal of *TS1*. With the relay de-energized, IC1's input should now have a signal.

Set the signal generator as close as possible to 1050 Hz. Adjust *R2* until the voltmeter reading drops to near zero, indicating that *IC1* is decoding. Remove the signal generator and the voltmeter should go back to the supply voltage reading. Perform this step several times to make sure that *IC1* is operating with each application of 1050 Hz. Turn off the audio generator and the dc power.

Remove *IC1* from its socket and install *IC2* in its socket. Connect the dc voltmeter between pin 3 of *IC2* and ground. Turn on the dc power. Connect a jumper to circuit ground and touch the other end to pin 2 of *IC2*. Note that the voltmeter reading is the supply voltage. After about 10 seconds, the voltmeter should drop back to near zero, indicating that *IC2* has timed out. If the timing is too short, increase the value of *R5*. Conversely, if it is too long, reduce the value of *R5*. Check the timing cycle several times to make sure it is in a range of 7 to 14 seconds. Turn off the power supply and remove the jumper.

Remove *IC2* from its socket and install *IC3* in its socket. Connect one end of a jumper to circuit ground and the other end to pins 1 and 2 of *IC3* simultaneously. Relay *K1* should close and lock in. Wait for I4 time-out, and note that the relay opens. Repeat this operation, ending with the relay closed. Remove the jumper and connect it between the supply and either pin 1 or 2 of *IC3*. Remove the jumper and the dc supply.

Once all tests have been made., install all of the ICs. Apply the dc supply and put the 1050-Hz signal from the audio generator on the input. After *IC2* has timed out, the relay should close. Remove the signal input, depress *S1*, and the relay should open and remain open. The circuit is now ready for installation. Note: The tone oscillator if built and frequency-checked for 1050 Hz can be used as an audio generator.

The tone oscillator in Fig. 8 requires only one adjustment to align the frequency adjustment pot for a 1050-Hz output at TP (square wave) or W (triangle wave). Adjust Rt for 50 to 60 mV p-p signal at W, or wait and adjust Rt for consistent tone-alert operation when the decoder is finished and aligned (see Fig. 7 alignment and adjustment information).

They will be fixed-mounted and can even be in the attic if you are not in an aluminum-siding-covered house. The station won't move on you, I promise, so there's no fuss with rotors. Even the "cheapie" monitor radio sounds fine on a good outside antenna instead of its telescoping delight, but try the whip first—it's free with the radio and might amaze you.

As an example, on the Weather-cube from Radio Shack that I had and tried first, indoors and on the whip it sounded OK, but some days it was noisy and some days my tone feature was marginal. That you don't ever want, so just for kicks I lashed it up to my 11-element 2m antenna—unmodified—and the difference was astounding no matter where the antenna was pointed! Not only perfect local copy, but the same on another channel from Chicago 250+ miles away. I merely took a panel-mount screw-in type UHF connector to match the plug on my 2m lead-in with RG-8, soldered a piece of #22 insulated wire to the center pin, wrapped 8 turns (arbitrary) around the base of the collapsed whip (top of radio), and then soldered the remaining end to the ground side of the UHF female. Connect the male from the antenna and voila—signal. Nothing fancy, nothing resonant, perfect copy. Proves if you got it—try it.

In all the configurations I show in Fig. 3, I run the radio off the power source of Fig. 1. In some, that takes a dropping resistor in the + lead to the radio to drop the power source +12 V dc down to the required radio voltage. Most pocket and portable radios of this weather type run off a +9-V dc transistor radio battery. The resistor will be Ohms = 3 volts divided by the radio current in Amps. Wattage of the resistor is 3 volts times the radio current in Amps. Simple Ohm's law. Why, even the appliance operators should not fear this project.

I have shown some various configurations I have tried and listed some possible uses using these lashups. The possibilities are as endless as your imagination and time. The examples are specific, but let me generalize a bit.

Configuration 1—This was the original idea: any low-Z speaker output below about 3 Watts, a radio needing about 1/2 Amp or less of +12 V dc or less, and you're in!

Configuration 2—For radios that already have a tone-alert feature, but you still like the standby battery idea.

Configuration 3—Use the idea with a scanner or monitor and decode only net or special calls to be tone type (RTTY?).

Configuration 4—Use a retuned FM tuner, hamfest salvage monitor boards, or 1-to-4-crystal older monitor boards. Buy one crystal—be weather safe! I have seen several of these older monitor boards showing up around the hamfests (Dayton and Indy so far) for $10 or less.

Configuration 5—Same as idea 3 using monitor or scanner.

Configuration 6—Use the time tones of WWV with an inexpensive Timecube™ from Radio Shack. Retune the decoder board to work on the WWV tones you want. Use for contests, 10-minute reminder, etc.

Configuration 7—Use the idea with a converted 11m CB-radio board from one of the flyers (Olson) for use as a local net or ragchew call-up on 10m. The audio outputs are usually missing off these (use Fig. 4), and the transmitter you don't care about for a monitor!

CODE QUICK

IT'S INCREDIBLE

"Been trying to master code for years," says New Ham. "Code Quick finally made it possible for me. How do I thank you!"

Now you too can master Code for your first ham ticket or break through tough plateaus to upgrade to 13 or 20 wpm in days. Does that sound to good to be true? **Code Quick** is a revolutionary breakthrough discovery based on tested learning principles which amazingly simplifies the learning of Morse code!

Here is how the system works. Each letter is learned not as dah's and dit's but the way the whole character sounds in straight English sound-alikes. For instance, the letter D is learned as **"Dog Did It"** not as dah did di.

Stop torturing yourself any longer with old fashioned methods! Send $39.95 today to WHEELER APPLIED RESEARCH LAB, Box 3261, City of Industry, CA 91744. Ask for Code Quick #103.(Calif. residents add 6% state sales tax.) Your research tested kit containing 5 power-packed cassettes in a beautiful vinyl case, visual breakthrough image cards and original manual will be forwarded the same day by postage-paid U.S. mail.

One User Comments:

"First new idea in code study and the darn thing works! So much fun you don't realize how much you're learning!"
M.S. Greneda, Miss.

Hundreds of satisfied customers!

You can't lose! Follow each simple step. You must succeed or return the kit and receive an immediate 100% refund! Take your first step to success today...

Introducing

NoVax
MOBILE CONNECTION

YOUR OWN AUTOPATCH FOR SIMPLEX OPERATION

NoVax
ON
OFF
Pwr
DISCONNECT
CONNECT
SCAN

ONLY
169^{95} KIT

Wired and Fully Tested
$219.95 • Shipping $3.50 in U.S.A. • N.Y.S. Residents add appropriate sales tax

Hundreds already in operation • Call anyone—anywhere—anytime

NOVAX interfaces your standard 2 meter; 220; 450; etc. base station and DTMF (Touchtone) Telephone, using a high speed scan switching technique so that you can direct dial from your automobile or with the HT from the backyard or poolside —automatically. Easy installation. Ringback (reverse autopatch) option available for $29.95 kit—$39.95 factory wired.

- SMALL SIZE—(5" x 6" x 2")
- STATE OF THE ART CIRCUITRY 12–16 V.D.C.
- ADJUSTABLE ACTIVITY TIMER (clears out if mobile is out of range)
- EASY INTERFACING with radio audio & squelch circuit
- SINGLE DIGIT CONTROL (connect and disconnect)
- 3 MIN. CALL DURATION TIMER

TO ORDER—SEND Check—Money Order (MasterCard or Visa accepted) to:
R.W.D. Inc., Oriskany, N.Y. 13424 or call (315)-829-2785 ✓21

MORE THAN A SIMPLEX AUTOPATCH!

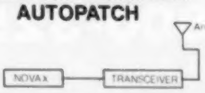
NoVax
MOBILE CONNECTION

NOVAX IS NOT JUST A SIMPLEX AUTOPATCH...IT'S A:

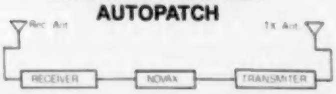
DUPLEX AUTOPATCH
REMOTE SWITCH
MESSAGE SECRETARY
EMERGENCY ALERT

Here's an example...

NOVAX AS A SIMPLEX AUTOPATCH



NOVAX AS A DUPLEX AUTOPATCH



FOR MORE DETAILS CALL OR WRITE:
NOVAX—R.W.D. INC. • ORISKANY, N.Y. 13424 • 315-829-2785 ✓21

DOLLAR SAVER/SPACE SAVER
WELZ SP-300 SWR & POWER METER
1.8 to 500 MHZ/1 W to 1 KW

STATION METER
CALIBRATION
FUNCTION
WELZ
SP-300

Exclusive cross over frequency range
3 Transmitter/3 Antenna Connectors.
One SWR/Power for the serious amateur who operates all bands, HF to 450 MHz

Serious Dealers Listing Available.

N.C.G. CO.
NCG

318

1275 N. Grove St.
Anaheim, Cal. 92806
(714) 630-4541

NOTE: Price, Specifications subject to change without notice and obligation.

Configuration 8—Similar to 7, only unconverted CB to monitor CB for REACT channel 9, weather, emergencies.

Configuration 9—I did not show a Configuration 9, but don't over look the possibilities in any of the configurations of added poles on the relays if needed to switch in a tape recorder on those tone call-ups to record a message while you are out. You get a tone call and the caller leaves a message—a nice feature! The recorder can run off the power source just like the radio with an appropriate dropping resistor.

Summary

For the time and money involved, I doubt you could spend a more rewarding weekend of effort. If I were starting from scratch right now and had nothing, I would probably go the Fig. 1 route just for sheer simplicity and lack of cost. The ac power/dc backup is a must. Then go with Fig. 3, Configuration 1. The Radio Shack "CUBE" is a nice little performer for under $20, and it's much less on sale. I have included an Alignment and Adjustment section (see box), and most of these notes are taken right from the original authors' information. I have tried them all, and they work, so I decided to pass them along unchanged. All are of the nature that once done correctly, you can forget them and just enjoy the results. I have not noticed any drift-type problems or anything that would cause a problem when you are counting on the monitor to be working. A very reliable device indeed is what it turned out to be. May your marriage of components and parts be as happy and long lived as mine. ■

MIDCOM

CALL NUMBER ONE!
CARLOAD INVENTORIES • ROCK BOTTOM PRICES
SUPER-FAST SERVICE

LINES: AEA, AVANTI, ASTRON, ALLIANCE, ALPHA, BEARCAT, BIRD, BENCHER, CUSHCRAFT, COLLINS, CDE, DRAKE, DENTRON, HY GAIN, HUSTLER, ICOM, KANTRONICS, KLM, KENWOOD, MICROLOG, MINI-PRODUCTS, MOR GAIN, MIRAGE, MFJ, NYE, PALOMAR ENG, REGENCY, SWAN, TEN TEC, UNIVERSAL, UNARCO-ROHN, VIBROPLEX

CALL TOLL FREE 1-800-325-3609
IN MISSOURI 314-961-9990

52 MID-COM ELECTRONICS • 8516 MANCHESTER ROAD • BRENTWOOD, MO 63144
VISA

SAVE $150

J.W MILLER AT-2500 Automatic Antenna Tuner. Apply power - logic & motors tune to optimum match. Continuous tuning 3-30 MHz, 2500w PEP. Matches 10-300 ohm coax or long wires & bal. line with ext. balun to 50 ohms. SWR & Power meter w/250 & 2500w scales - fwd or ref. Shows RMS CW & PEAK on SSB. 115/230vac/13.5vdc @ 1A. 17"w × 5¼" × 14"d, 17 lbs.

Regular $850 - ***Sale Price $699⁹⁵***

Quantity at Sale Price Limited. Order direct from this ad. Send Check or Money Order. For prompt shipment Call TOLL FREE 1-800-558-0411 & use MASTERCARD or VISA; COD orders accepted. Allow $8.50 for UPS shipping chgs.

MasterCard VISA

AMATEUR
ELECTRONIC SUPPLY ®

4828 W. Fond du Lac Avenue
Milwaukee, Wisconsin 53216
Phone: (414) 442-4200
Wisconsin WATS: 1-800-242-5195
Nationwide WATS: 1-800-558-0411
AES Branch Stores in: Clearwater, FL • Orlando, FL • Wickliffe, OH • Las Vegas, NV

Operates from external 12VDC @200 ma.

NEW . . . $99.95

THE CONTESTER™

Computerized Morse Code Keyer

WITH THE NEW AEA MODEL CK-2, YOU TOO CAN HAVE THE WINNER'S EDGE

The model CK-2 "CONTESTER" is part of the latest generation of famous AEA computerized electronic keyers. Like many of our other innovative electronic products, the Contester™ keyer utilizes a custom AEA microcomputer with proprietary copywritten software. The CK-2 retains virtually all the remarkable features of the CK-1 predecessor such as an automatic serial number generator, large soft-partitioned memory with editing capabilities, etc. In addition, we have added CMOS memory with internal battery keep-alive provisions, automatic repeat mode and a lower price! See it now so you too can appreciate the fine quality of design and craftsmanship that goes into all AEA products.

ACCESSORIES:
AC-2 350 Ma 12 VDC Wall Adaptor $9.95
DC-2 Mating Rechargeable 8 hour Battery Pack and Charger $39.95

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

call or visit:

AEA
Brings you the Breakthrough!

C & A Roberts, Inc.
22010 So. Wilmington Ave.
Suite 105, Carson, Ca. 90745
(213) 834-5868

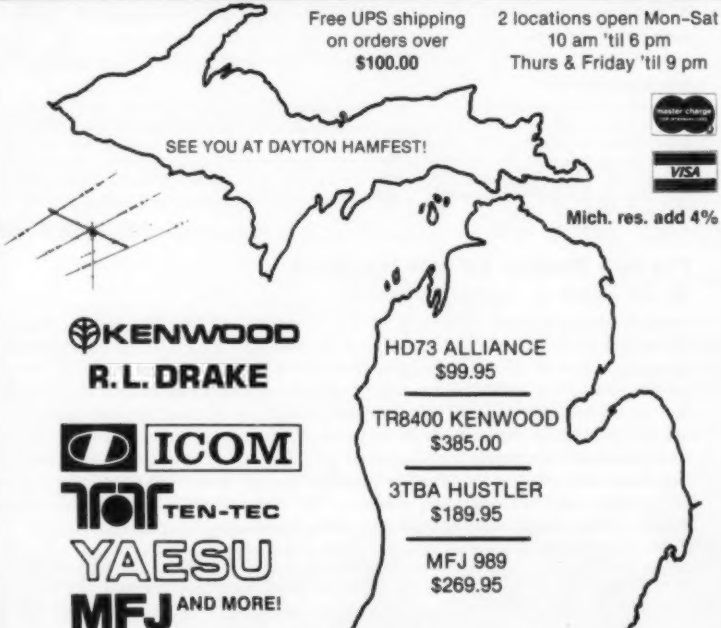
Free UPS shipping on orders over **$100.00**

2 locations open Mon-Sat
10 am 'til 6 pm
Thurs & Friday 'til 9 pm

master charge

VISA

Mich. res. add 4%



SEE YOU AT DAYTON HAMFEST!

HD73 ALLIANCE
$99.95

TR8400 KENWOOD
$385.00

3TBA HUSTLER
$189.95

MFJ 989
$269.95

KENWOOD
R. L. DRAKE
ICOM
TEN-TEC
YAESU
MFJ AND MORE!

CALL FOR QUOTES

RSE HAM SHACK

2 locations
1207 W. 14 Mile Road, Clawson MI 48017
313-435-5660
31155 Plymouth Road, Livonia MI 48150
313-522-4232

✓117

Digital Multimeter

The Drake DM2350 Digital Multimeter is a convenient, small handheld liquid crystal display meter ideal for the serviceman or hobbyist. This 3½ digit meter is auto-ranging, auto-zeroing, has polarity indication, and an over-range warning signal. Battery life is greater than 300 hours with a "low battery" indicator. A continuity test sounds a signal when circuit resistance is less than 20 ohms. Dc accuracy is a basic 0.8%.

Batteries, probes, 20 amp current shunt, spare fuse and soft carrying case all included at **$95.95**

Add **$2.50** shipping and handling per order.

Send check with order and provide street address for UPS shipment. Ohio residents add Sales Tax. Charge card buyers may call toll free:

1-800-543-5613

DRAKE

In Ohio, or for information call:
1-513-866-2421

R. L. DRAKE COMPANY
540 Richard Street, Miamisburg, Ohio 45342

INSTITUTIONAL AND DEALER INQUIRIES INVITED.

Wayne Green Books

NEW ARRIVALS

Annotated BASIC
A New Technique for Neophytes
Annotated BASIC
KILOBAUD KLASSROOM
A COURSE IN DIGITAL ELECTRONICS where you build your own computer!
$8.95
THE NEW WEATHER SATELLITE HANDBOOK

*TRS-80 is a trademark of
Radio Shack Division of Tandy Corp.

Annotated BASIC—A New Technique for Neophytes.

BASIC programming was supposed to be simple—a beginner's programming language which was so near to English that it could be easily understood. But, in recent years, BASIC has become much more powerful and therefore much more difficult to read and understand. BASIC simply isn't basic anymore.

Annotated BASIC explains the complexities of modern BASIC. It includes complete TRS-80* Level II BASIC programs that you can use. Each program is annotated to explain in step-by-step fashion the workings of the program. Programs are flowcharted to assist you in following the operational sequence. And—each chapter includes a description of the new concepts which have been introduced.

Annotated BASIC deals with the hows and whys of TRS-80 BASIC programming. *How* is a program put together? *Why* is it written that way? By observing the programs and following the annotation, you can develop new techniques to use in your own programs—or modify commercial programs for your specific use.

Annotated BASIC Volume 1 contains Projecting Profits, Surveyor, Things to Do, Tax Shelter, Introduction to Digital Logic, Camelot, The Soundex Code, Deduction, Op Amp, Contractor Cost Estimating.
BK7384 $10.95 ISBN 0-88006-028-X

Annotated BASIC Volume 2 contains Rough Lumber List, Trip Mileage, Flight Plan, OSCAR Data, SWR/Antenna Design, Supermaze, Petals Around the Rose, Numeric Analysis, Demons, Air Raid, Geography Test, Plumbing System Design. **BK7385 $10.95** ISBN 0-88006-037-9

Order Both Volumes and Save! **BK738402 $18.95**

Kilobaud Klassroom—
A practical course in digital electronics

by George Young and Peter Stark

Learning electronics theory without practice isn't easy. And it's no fun to build an electronics project that you can't use. *Kilobaud Klassroom*, the popular series first published in *Kilobaud Microcomputing*, combines theory with practice. This is a *practical* course in digital electronics. It starts out with very simple electronics projects, and by the end of the course, you'll construct your own working microcomputer!
Authors Young and Stark are experienced teachers, and their approach is simple and direct. Whether you're learning at home or in the classroom, this book provides you with a solid background in electronics—and you'll own a computer that you built yourself!

Kilobaud Klassroom contains Getting the Ball Rolling, Gates and Flip-Flops Explained, J.K. Flip-Flops and Clocked Logic, PC Boards and Power Supplies, Hardware Logical Functions, Voltage, Current and Power Supplies, Transistors, Diodes and OP Amps, Pulses and More Pulses, Counters and Registers, Bus Traffic Control, ROM and RAM Memories, I/O Circuitry, Parallel and Serial I/O Ports, Computer I/O III, Computer I/O IV, Computer I/O V, Processor Connections, Finally . . . The Kilobaud Krescendo, Eproms and Troubleshooting, Expansions and Programming, Machine-Language Programming, Assembly-Language Programming, Connecting to the Outside World.

ISBN 0-88006-027-1 **BK7386 $14.95**

The New Weather Satellite Handbook

By Dr. Ralph E. Taggart WB8DQT

Here is the completely updated and revised edition of the best-selling *Weather Satellite Handbook*—containing all the information on the most sophisticated spacecraft now in orbit. Dr. Taggart has written this book to serve both the experienced amateur satellite enthusiast and the newcomer. The book is an introduction to satellite watching that tells you how to construct a complete and highly effective ground station. Not just ideas, but solid hardware designs and all the instructions necessary to operate the equipment are included. An entire chapter is devoted to microcomputers and the Weather Satellite Station. And for the thousands of experimenters who are operating stations, *The New Weather Satellite Handbook* details all the procedures necessary to follow the current spacecraft.

Weather Satellite contains Operational Satellite Systems, Antenna Systems, Weather Satellite Receivers, A Cathode Ray Tube (CRT) Monitor for Satellite Picture Display, A Direct-Printing Facsimile System for Weather Satellite Display, How to Find the Satellite, Test Equipment, Microcomputers and the Weather Satellite Station, Station Operations.

ISBN 0-88006-015-8 available now! **BK7383 $8.95**

FOR TOLL-FREE ORDERING CALL 1-800-258-5473
WAYNE GREEN BOOKS • PETERBOROUGH NH 03458

Use the order card or itemize your order on a separate piece of paper and mail to Wayne Green Books Att: Sales • Peterborough NH 03458.
Be sure to include check or detailed credit card information. (Visa, Master Charge or American Express accepted.)
No C.O.D. orders accepted. All orders add $1.50 for the first book, postage and handling; $1.00 each additional book; $10.00 per book foreign air mail.
Please allow 4-6 weeks after publication for delivery. Questions regarding your order? Please write to Customer Service at the above address.

Better by the dozen.

1. NEVER SAY DIE—If you want controversy, Wayne Green W2NSD/1 will give it to you. His popular column ranges from travelogue to tirade and is guaranteed to entertain, inspire and enlighten you.

2. DX—This glove-trotting column keeps you informed about the news of the DX world from Kingman Reef to Bahrain.

3. CONTESTS—You get all the news on the contest world from Robert Baker WB2GFE. He'll give you information on upcoming events and results from recent contests.

4. FUN—Just for fun, John Edwards KI2U provides you with wacky puzzles, quizzes, and games that test your ham mettle.

5. FCC—If you're looking to the future, these outtakes from the Federal Register chronicle changes in policy and regulations that relate to amateur radio.

6. RTTY LOOP—To keep you abreast of radioteletype developments, Marc Leavey WA3AJR explains the new RTTY equipment, the increasing role of computers in RTTY, and other matters of interest to digital communications fans.

7. REVIEWS—Before you buy, save yourself some money . . . check *73*'s in-depth evaluation of the latest gear.

8. HAM HELP—As a service to you, *73* prints your questions in our magazine. This helps you to obtain hard-to-get parts, schematics, and owner's manuals.

9. SATELLITES—From Phase III to TVRO, *73 Magazine* covers the news of the satellite world like no other radio amateur magazine.

10. NEW PRODUCTS—This brief look at the latest ham equipment on the market keeps you on top of new developments in amateur radio.

11. AWARDS—To find out what certificates are available where, read Bill Gosney KE7C's coverage of all the ham radio awards.

12. CONSTRUCTION—The builder's magazine . . . that's *73*. You get the best projects from the best authors every month.

Send me a dozen issues of 73 MAGAZINE FOR RADIO AMATEURS for the dozen reasons listed above!

☐ 1 year, USA $19.97
☐ 1 year, CANADA, US funds $27.97
☐ 1 year, FOREIGN, Surface, US funds $44.97
☐ MC ☐ VISA ☐ AM. EXP. ☐ CHECK/MO

Name ____________________
Address ____________________
City ____________ State ______ Zip ______
Card # ____________ Ex. Date ______
Interbank # ____________________
Signature ________

323186

Subscription Department
P.O. Box 931
Farmingdale, NY 11737
1-800-258-5473
Foreign air mail, please inquire.

73 MAGAZINE
73 MAGAZINE FOR RADIO AMATEURS

The HAM SHACK

808 N. Main
Evansville, IN 47711

AEA MBA reader	$270
MBA reader/converter	$355
CK-1/KT-1 memory/trainer keyers	$109
Isopole antenna, 2 meter	$36
ALLIANCE HD-73 rotator	$99
ASTRON RS-12A power supply	$69
BENCHER BY-1 paddle	$36
BUTTERNUT HF6V multiband vertical	$109
CUBIC ASTRO 103	$1175
DAIWA CNA-2002 2.5 KW autotuner	$425
HAL CT-2100 RTTY terminal	$695
HY-GAIN TH7DX beam antenna	call
Ham IV rotator	$169
Tailtwister rotator	$239
ICOM 2AT handheld	$235
3AT/4AT handhelds	$269
730 hf transceiver	$700
720A/PS-15 hf transcvr/ power supply	$1295
KLM KT-34A triband beam	$315
KT-34XA triband beam	$475
LARSEN 5/8 wave mag mount 2m antenna	$39
MFJ 496 keyboard	$290
MIRAGE B-1016 2-meter amplifier	$239
SHURE 444D microphone	$50
VOCOM pocket power, 2m.	$195

812-422-0231 ✓449

MON-FRI 9AM-6PM • SAT 9AM-3PM

Write for our new and used equipment list

Radio equipment
not included

Also Available ....
Floor Space: 51" Wide by 30" Deep
$199.50

. . . at last . . .
your shack organized!

A beautiful piece of furniture — your XYL will love it!

$184.50 S-F RADIO DESK

Deluxe - Ready to Assemble

Designed with **angled** rear shelf for your viewing comfort and ease of operation.

FINISHES: Walnut or Teak Stain.

Floor Space: 30" Wide by 30" Deep

Additional Information on Request.

Checks, Money Orders, BankAmericard and Master Charge Accepted.

F.O.B. Culver City. (In Calif. Add 6% Sales Tax.)

DEALER INQUIRIES INVITED

S-F Amateur Radio Services

4384 KEYSTONE AVENUE • CULVER CITY, CALIF. 90230 — PHONE (213) 837-4870

✓65

Homebrew Headquarters

Receive 2 meters on your HF rig

April Issue 73
Input 144-146 MHz
Output 28-30 MHz
NF < 2 db
Power 8-16V, 15 mA
Size 2-3/4 X 2-3/8 X 7/8

2 Meter Converter

Shown less Enclosure ✓454

Other kits, pc boards and parts
for amateurs available.
Send for catalog.

SEE YOU AT DAYTON

Catalog — 25 cents

RADIOKIT
Box 411S, Greenville, NH 03048
(603) 878-1033

WORK THE U.H.F. BANDS

Add a transverter or converter to your existing 10m, 6m or 2m equipments. Choose from the largest selection of modules available for DX, OSCAR, EME, ATV.

TRANSVERTERS

MMT 50-144 $234.95
MMT 144-28 $219.95
MMT 432-28 (S) $319.95
MMT 439-ATV $379.95
MMT 1296-144 $399.95
OTHER MODELS AVAILABLE

CONVERTERS

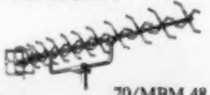
Choose from many models to suit your needs.
Examples: MMC 432-28, MMC 426/439—ATV
MMK 1296-144, MMC 1280—ATV
Write for details and available options.

FILTERS

Prevent OSCAR 8 Mode J desense
Use MMF200-7 $42.95
Stop receiver IMD birdies
Use PSF432 $59.95

ANTENNAS

420-450 MHz J-beams
48 el. 15.7 dBd $75.75
88 el. 18.5 dBd $105.50
1250-1300 MHz loop yagi 1296-LY $49.75



70/MBM 48

Send 36¢ stamps for full details of all our VHF/UHF items.

Pre-selector filters	Transverters
Low-pass filters	Converters
Varactor triplers	Antennas
Pre-amplifiers	Crystal Filters

VISA
master charge

Spectrum International, Inc.
Post Office Box 1084S
Concord, Mass. 01742 USA

✓436

Orbit

ORBIT is the Official Journal for the Radio Amateur Satellite Corporation (AMSAT), P.O. Box 27, Washington, DC 20047. Please write for application.

For a **FREE SAMPLE COPY** please send $1 to cover First Class Postage and handling to: Orbit, 221 Long Swamp Road, Wolcott, CT 06716.

AFFORDABLE CW KEYBOARD FROM $69.95

Transmits perfect Morse Code • Built-in 16 character buffer • Internal speaker and sidetone • Reed relay output eliminates keying problems • All solid state circuits and sockets for reliability • Speed range 5—45 WPM • Perfect companion to our MORSE-A-WORD CW code reader.

MORSE-A-KEYER KIT, model MAK-K, Complete kit of parts & manual	$159.95
MORSE-A-KEYER, model MAK-F, Factory wired & tested	$199.95
MORSE-A-KEYER ESSENTIAL PARTS KIT, model EPK-K	$ 69.95

(Essential parts kit for home-brewers consists of pc board, board parts and manual. You supply ASCII keyboard, cabinet, power supply & miscellaneous parts.)

Send check or money order. Use your VISA or MasterCard. Add $5.00 shipping and handling for Continental U.S. Wisconsin residents add 4% Wisconsin State Sales Tax.

Microcraft Corporation Telephone: (414) 241-8144
Post Office Box 513G, Thiensville, Wisconsin 53092

✓50

Radio World

CENTRAL NEW YORK'S MOST COMPLETE HAM DEALER

ROBOT 800
ICOM IC-720
KENWOOD TS830S
DRAKE TR7-DR7
YAESU FT707

Featuring Kenwood, Yaesu, Icom, Drake, Ten-Tec, Swan, Dentron, Alpha, Robot, MFJ, Tempo, Astron, KLM, Hy Grain, Mosley, Larsen, Cushcraft, Hustler, Mini Products, Bird, Mirage, Vibroplex, Bencher, Info-Tech, Universal Towers, Callbook, ARRL, Astatic, Shure, Collins, AEA. *We service everything we sell!*

Write or call for quote. **You Won't Be Disappointed.**

We are just a few minutes off the NYS Thruway (I-90) Exit 32

OUT OF STATE
ORDER TOLL FREE
800-448-9338

ONEIDA COUNTY AIRPORT TERMINAL BUILDING
ORISKANY NEW YORK 13424
N.Y. Res. Call (315) 736-0184

Warren - K2IXN
Bob - WA2MSH
Al - WA2MSI

✓397

Organize your shack with a

CLUTTERFREE MODULAR CONSOLE $203.35

- Large, 42" H x 57" W x 29"D
- Strong groove-construction
- Mar-resistant wood grain finish
- Options, drawers & face plate
- For ham or home computer
- Visa and Master Charge

CLUTTERFREE MODULAR CONSOLES

P.O. Box 5103 Tacoma, WA 98405
(206) 759-1611 ✓89

PORTA-PEATER™ INSTANT REPEATER

Command and control module makes an instant repeater from any 2 radios with absolutely no modifications to the radios. Interfaces via the external speaker and mic jacks. Perfect for a personal, emergency, or fixed repeater. Write or call for detailed data manual. We accept VISA and M/C. Request catalog.

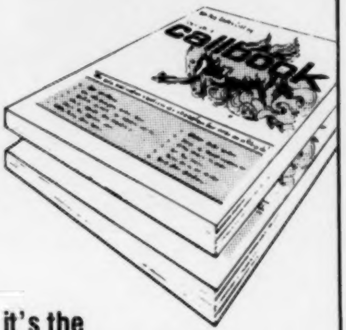
- 4 individual CW-IDs (1K PROM)
- VOX—COR, COR triggers
- Adj. 0-15 min. ID cycle timer
- Adj. 0-15 min. Time Out timer
- Adj. 0-30 sec. hang timer
- Adj. 20db local mic amp
- True repeater beacon, or manual modes
- 250 volt switching capability
- Complete gain/interface controls
- Complete technical manual
- PCB size 5¾" x 5¾"
- 22 pin edgecard interface

$99.00 **Assembled, Tested, Burned In, Programmed (Inc. $3. postage)**

✓302

W-S ENGINEERING
P.O. BOX 58
PINE HILL, N.J. 08021
24 HR. PHONE: 201-852-0269

When it comes to *AMATEUR RADIO QSL's . . .*



it's the *ONLY BOOK!*

US or Foreign Listings

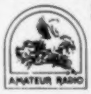
1982 callbooks

Here they are! The latest editions. World-famous Radio Amateur Callbooks, the most respected and complete listing of radio amateurs. Lists calls, license classes, address information. Loaded with special features such as call changes, prefixes of the world, standard time charts, world-wide QSL bureaus, and more. The U.S. Edition features over 400,000 listings, with over 70,000 changes from last year. The Foreign Edition has over 370,000 listings, over 60,000 changes. Place your order for the new 1982 Radio Amateur Callbooks, available now.

	Each	Shipping	Total
☐ US Callbook	$18.95	$3.05	$22.00
☐ Foreign Callbook	$17.95	$3.05	$21.00

Order both books at the same time for $39.95 including shipping.

Order from your dealer or directly from the publisher. All direct orders add shipping charge. Foreign residents add $4.55 for shipping. Illinois residents add 5% sales tax.



SPECIAL LIMITED OFFER!
Amateur Radio Emblem Patch
only $2.50 postpaid

Pegasus on blue field, red lettering. 3" wide x 3" high. Great on jackets and caps.

ORDER TODAY!

RADIO AMATEUR **callbook** INC.
Dept. B
925 Sherwood Drive
Lake Bluff, IL 60044, USA

✓61

IC-22U

ICOM VHF Mobile Performance at a Budget Price

TONE
LOW
+SHIFT
HIGH
7 2 4
6 9 7
SQL
VOL
DUP 1
DUP 2
SIMP
+600
ICOM IC-22U
VHF FM TRANSCEIVER

Imagine IC-22S performance and simplicity . . . plus 800 channels . . .

Easy to Operate.

- Convenient pushbutton frequency selection
- Monitor repeater inputs at the flip of a switch
- Hi/Low power pushbutton selectible
- Touch Tone® available with optional HM8 microphone
- Convenient hookup points for sub-audible tone encoder or continuous tone controlled squelch system
- 5 KHz step (800 T/R channels standard)
- Covers the complete 144-147.995 MHz ham band

ICOM Performance.

- 5 helical resonators for outstanding selectivity
- Continuous duty rated 10 watt transmitter — rugged performance
- Excellent receiver sensitivity
- Patterned after ICOM's extremely successful and reliable IC-22S.
- APC circuit for protection of finals

Versatile.

- Easily set up for CAP/MARS use
- 8 pin mic connector
- 9 pin undedicated accessory socket
- Remotable frequency selection option (Ex-199)
- Compact size [6.2 in (W) x 2.3 in (H) x 8.6 in (D)]

ICOM

2112 - 116th Avenue NE, Bellevue WA 98004
3331 Towerwood Dr., Suite 307, Dallas, TX 75234

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

Hut, 2,3,4...

ICOM
IC-4AT
1 2 3 A
4 5 6 B
7 8 9 C
* 0 # D
ICOM
IC-4A
ICOM
IC-3AT
3 A
6 B
9 C
# D
ICOM
IC-3A
ICOM
IC-2AT
ICOM
IC-2A

440, 220, and 146MHz. Any way you go, ICOM has you covered...

Complete, affordable and fun...That's the new ICOM IC-4AT 440MHz handheld. Identical in size and appearance to the very popular IC-2AT, the IC-4AT gets you into the 440MHz band at a very attractive price. The accessories used with the IC-4AT are the same items you may previously have purchased for use with your 2AT.

The IC-4A and IC-4AT cover 440 to 449.995MHz in 5KHz steps, giving full coverage of the FM portion of the 440MHz band. Featuring ±5MHz offsets, top panel switch for control of PL, 16 button Touchtone® pad, thumbwheel switch frequency selection and ICOM performance, the IC-4A is unsurpassed in a 440MHz handheld.

The IC-4A comes standard with BP3 battery pack, flexible antenna, belt clip, earphone and wrist strap.

ICOM

The World System

2112-116th Avenue NE, Bellevue, Washington 98004 / 3331 Towerwood Drive, Suite 307, Dallas, Texas 75234

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

REVIEW

THE MICROLOG ACT-1 RTTY/CW TERMINAL

At first glance, the Microlog ACT-1 bears a close resemblance to many other keyboards offered to the amateur RTTY and CW enthusiast. There's a keyboard, a couple of switches and an LED on top, and a bank of connectors on the rear panel. Unassuming? Perhaps, but in reality the ACT-1 serves as a firm reminder that appearances can be misleading.

The Features

The ACT-1 is a completely self-contained unit capable of sending and receiving Morse, Baudot, and ASCII codes. It also can send alphanumeric information in SSTV format. By "self-contained," we mean that a demodulator, AFSK generator, video board, and printer interface are all contained inside the keyboard's cabinet. No other devices are necessary, and a few simple connections are sufficient to put the system on the air.

All commands are entered via the 63-key keyboard. In addition to the usual alphanumeric keys, there are special keys like CTRL, KN, AR, SK, and Here Is. Pressing the CTRL or shift key along with one of the other keys results in a command being generated. CTRL M, for example, switches the unit from the RTTY mode to CW. Almost all commands are entered with just two keys. Listing, much less describing, all that the ACT-1 is capable of would take far more space than is available here, so we'll try to hit only the main points.

There is a dual-tone demodulator and a single-channel direct detector. Both demodulators can be inverted with a keyboard command. The dual-tone demodulator decodes both mark and space tones and has a keyboard-selectable high or low tone setting. The high-tone setting provides a standard 170-Hz shift with tones at 2125 and 2295 Hz and is preceded by a sharp bandpass filter. The low-tone setting is also factory set to 170 Hz, but tones are at 800 and 970 Hz. No bandpass filter is provided for this section.

If you find yourself copying a lot of broadcast services, you can reset the low tone pair easily to a more useful pair, like 425-Hz shift at 2125 and 2550.

The single-channel demodulator copies only the mark frequency and is set to decode at 800 Hz, which corresponds nicely to the peak in many receivers' CW filter. It generally is used for copying stations which are using a shift not programmed into either of the settings for the dual-tone demodulator.

Ease of tuning can be a big factor in the amount of satisfaction a demodulator gives. We have grown rather accustomed to the meter-tuning system used in HAL, Macrotronics, and other equipment, so the single LED used for tuning the ACT-1 took us by surprise. It works very well and is at least as efficient as a meter. Best of all, there is a regeneration circuit that lets the user hear what's being decoded. You simply tune the receiver until the code coming from the ACT-1's speaker sounds right.

Tuning is virtually foolproof in either RTTY or CW modes, and the regeneration should be particularly welcome to hams with impaired vision. Those of us who crave silent operation will be equally pleased to know that the monitor is easily turned off by flicking a switch on the front panel. And if you still insist on using an oscilloscope for tuning, rest assured that outputs are provided for this purpose.

Provision for transmitting with either AFSK or FSK is included. Like most manufacturers, Microlog is partial to the AFSK method, and they advocate its use for a variety of reasons which you may or may not find compelling. For rugged individualists who prefer direct FSK keying, ample information on connecting the ACT-1 to a variety of transceivers is included.

Actually, connection to everything is easy and very well documented in the instruction manual. Much attention has been paid to making the ACT-1 compatible with virtually every rig available. You won't have to haywire any special interfaces to get the ACT-1 on the air.

CW keying is available for both negative- and positive-keyed rigs. The maximum negative keydown rating is -150 V at 50 mA. Positive keying is rated at 40 V at 300 mA.

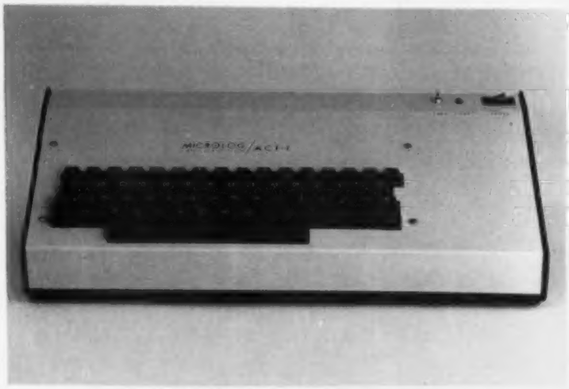
Rear-panel jacks also are provided for a cassette tape recorder, a 40-column serial printer, and an external demodulator. Video output is via a standard photo jack, but since there is plenty of room for a BNC connector, I wonder why one wasn't used.

There is true split-screen operation, allowing the operator to see what he is typing into the buffer while receiving text on the bottom half. The text buffer holds up to 1300 characters, which is certainly respectable. To help customize the system to particular needs, the split line can be set anywhere from none at all to 20 lines down.

When transmitting, the ACT-1 can be set to send as soon as a character has been typed or it can wait until a complete word has been typed. The latter option is convenient because it allows you to catch and correct errors before they go out.

To aid receiving, an ANCW (anti-CW) feature is included, which behaves like the autostart found on other units. When enabled, ANCW inhibits display of non-RTTY signals and is very helpful when tuning across the band reading the mail. The UNOS (unshaft on space) and sync options also behave like similar features on other units. The UNOS shifts the ACT-1 to the LTRS mode on receipt of a Baudot word space code, which prevents the system from getting stuck in the FIGS mode if a burst of interference covers up the command to shift. The sync simply sends a blank code whenever the system is in the transmit mode, but there are no characters to transmit. Both UNOS and sync can be switched off and on from the keyboard.

Baudot speeds of 60, 66, 75, 100, and 132 words per minute, ASCII at 110 and 300 baud, and CW at 5-199 words per minute are available. In the RTTY mode, speeds are selected by typing CTRL X, entering the speed



The Microlog ACT-1. (Photo by KA1LR)

Rear view of the ACT-1. (Photo by KA1LR)

Inside the ACT-1. (Photo by KA1LR)

numerically, and then hitting any non-numeric key. This is fine for operators who rarely change speed, but annoying if you are trying to discover what speed a station is using by trying every possibility. Perhaps an option could be added to allow stepping through the speeds by repeatedly pressing a key.

Turning to features which some might term luxuries, there is a real-time clock whose display is always visible at the top of the screen. The time can be transmitted by entering a simple command. The clock must, of course, be reset every time the unit is turned on, but Microlog says that the ACT-1 is designed for continuous-duty operation and never needs to be turned off.

Memories

While the ACT-1's array of memories is not as extensive as that which certain microcomputer interface combination systems offer, there is enough to satisfy most hams' needs. There are two ID memories which hold up to 19 characters each and ten message memories holding up to 40 characters each. The message memories are soft-partitioned, so you can program messages longer than 40 characters if you like. It is possible, for example, to create a single message 400 characters long, but then there won't be room for any other messages.

An eight-character WRU message allows storage of a short code. When the CT-1 receives text that matches the code exactly, it automatically transmits whatever is in the ID memory and then returns to the receive mode. Two selective-print memories allow others to leave a message on your equipment while you are away from the shack. Upon receipt of text that matches the text in the first memory, the printer is activated and hard copy is produced of everything the ACT-1 hears, assuming you have a printer connected. Receipt of text that matches the text in the second memory turns the printer back off. Used together, the WRU and selective-print feature represent a simple but effective means of providing unattended operation.

While not quite as convenient as on-board memory, a reliable interface is provided which allows information to be stored on a cassette tape recorder and played back at will. You can record and play back messages entered from the keyboard or copied off the air. Finally, thre are two preprogrammed messages. One sends an RYRY series and the other sends every letter of the alphabet in "quick brown fox..." form.

In Use

Once you have everything figured out (it took us a whole day!), you'll find that the ACT-1 is a powerful tool. You'll find yourself referring to the manual quite often, and it is here that we must voice a small complaint. The instruction manual is one of the best we've seen at describing the steps necessary for interfacing the unit to the rest of the station, but the organization of the how-to-use-it material could stand some improvement. Even the inclusion of a prompt card to be kept on the operating table could make a big difference. With so many commands that don't always use mnemonic devices to aid memory, a prompt card is a must.

Some basic information for beginning RTTY operators also is needed. The manual suggests that beginners get one of the "RTTY-primer handbooks." Since dealers' shelves aren't exactly overflowing with RTTY books, this advice isn't much help to the guy who just got his ACT-1 and wants to put it on the air right away. A short section on RTTY operating procedures really is needed.

We may complain about the manual, but we can't fault the ACT-1's performance. Using it is sheer, unadulterated pleasure! As far as we're concerned, the most important aspect of a self-contained unit is its demodulator, and we've seen some pretty horrible ones. Any reservations we may have had were quickly put aside as we watched the Sanyo monitor display perfect copy from an S-nothing signal buried under SSB splatter, CW, and a couple of other RTTY stations. A remarkable performance. We also enjoyed the variety of shifts that can be copied easily. Broadcast monitoring is great sport, and if you have a general-coverage receiver, you'll want to retune the second filter to 425 Hz immediately.

Operation in the RTTY mode was trouble-free and straightforward. CW operation is as good as anything else we've used—perfect copy from machine-sent code, not-so-perfect copy from the straight key and bug contingent.

Conclusions

Even if you've already decided to use a computer and interface combination for RTTY, the ACT-1 deserves careful consideration. The ACT-1, which has a suggested price of $995, has everything even a serious operator could ask for. Because it is self-contained, it takes up very little room on the operating desk. And even if you are planning to get a computer, a unit like the ACT-1 can free it for more important tasks.

For more information, contact *Microlog Corporation, 4 Professional Drive, Suite 119, Gaithersburg MD 20879.* Reader Service number 485.

Paul Grupp KA1LR/4
Casselberry FL

THE MFJ-312 VHF CONVERTER

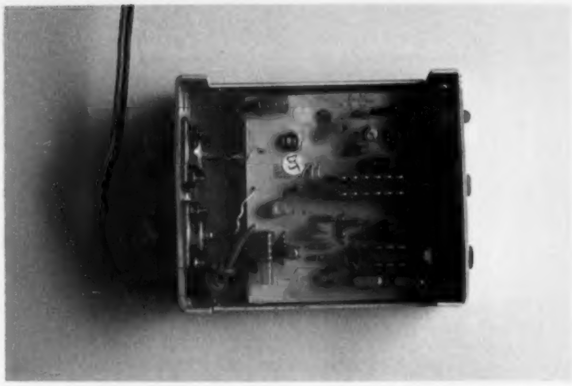
Most of us have wondered at one time or another just what takes place on our VHF public service bands. The scream of a squad car's siren, a black column of smoke on the horizon, or a threatening weather front in the southwest have given many a ham an urge to plunk down hard cash for a synthesized public service band receiver. If the spirit is willing but the pocketbook is not, take courage. MFJ has a clever new converter that allows a standard two-meter receiver to serve as a receiver for that band.

In most installations, the palm-sized MFJ-312 connects to a 12-V-dc power source and a two-meter antenna and transceiver. The converter covers the 160-164-MHz and 154-158-MHz bands, allowing access to police, fire, and NOAA weather transmissions in most areas.

There are only two switches and an LED on the front panel. The left-hand switch selects one of the two bands. The other switches the box in and out of the antenna line and also turns the power on and off.

The MFJ-312. (Photo by KA1LR)

To listen, you merely turn the converter on and tune the two-meter receiver as you would normally. In the 150-154-MHz band, you set the receiver to exactly 10 MHz below the desired frequency. Thus, 154.20 would be heard with the receiver set to 144.20, and 151.335 would be found at 141.335 on your rig's dial. In the 160-164-MHz band, it's a little more challenging—you must set the receiver 16 MHz below desired range. Since the activity in this band is generally limited to a single NOAA weather station, there isn't much of a problem.



The MFJ-312 with top cover removed. (Photo by KA1LR)

In Use

The MFJ-312 performs like a champ. Most listeners won't guess that a converter/receiver combination is being used unless you tell them. The MOSFET mixer and rf amplifier are undoubtedly responsible for the clean, image-free reception. As can be expected, there is a slight increase in noise level when the converter is switched on, but the level never reaches objectionable proportions.

I never tried an antenna cut to 154 MHz, but I suspect that using one might result in an even better performance than I experienced using antennas designed for two meters. For most purposes, a two-meter mobile or base antenna will be more than adequate.

I had a hard time deciding whether to keep the converter in the house or permanently installed in my car. If you contemplate mobile operations, you should be aware that some states and municipalities take a dim view of anyone in a vehicle monitoring the local gendarmes. And even if such activity is perfectly legal in your area, it's healthiest to mount the converter inconspicuously. Don't say I didn't warn you.

Of course, to make the most of this converter, you need a synthesized transceiver. So much the better if you have one with a lot of memories. It's often necessary to bounce between two frequencies to hear both sides of a conversation, so scanning is helpful, too. I used the converter for several months with a KDK transceiver that has two banks of five memories. I used one bank to store public service frequencies and the other for two-meter repeaters. Kenwood, Azden, Yaesu, and others also make transceivers whose scanning capabilities and large number of memories make them ideal for use with the 312.

An interesting feature is the feedthrough of two-meter signals when the converter is switched on. I'm not sure whether this was really intended or not, but MFJ makes the best of it and suggests that you program repeater frequencies amidst the police ones and listen to both even though the converter is switched on. Although signals in the two-meter band are heard with significantly reduced sensitivity in this mode, strong signals come through loud and clear. This is especially useful for those of us who feel obligated to keep an ear open for activity on a certain repeater but don't want to be switching the converter on and off all the time.

This brings up the certainty of accidentally transmitting into the device when it's turned on. MFJ says that the converter is protected against accidental transmissions at power levels up to 25 Watts, but warns that this sort of abuse might be hard on the transmitter's finals. For what it's worth, we pumped 40 Watts into the MFJ-312 for several seconds on many occasions, and neither the transmitter nor the converter complained.

The purists among you are probably wondering what effect if any the converter has on two-meter operations when it's *not* in use. Theoretically, it should have none, since it passes the signal straight through when it is switched out. We noted, however, a slight increase in swr and a corresponding decrease in receiver sensitivity. Emphasis must be placed on the word *slight*. In most areas, the loss either coming or going might not even be noticed. In areas where signals are often less than full-quieting and you need to squeeze every last dB out of your system, you should make provisions for switching the converter out of the circuit when it's not in use.

Conclusions

The MFJ-312 greatly expands one's listening horizons at the very attractive price of $59.95. Using a two-meter rig as the i-f stage makes good sense economically for a ham already equipped with a digital wonder-radio. If you find you enjoy public service listening, the converter will be one of most useful pieces of radio equipment to be had at such a low price. And if you decide that it's really not your cup of tea after all, you'll have the satisfaction of knowing you found out without blowing a week's pay for a scanner!

For more information, contact *MFJ Enterprises, PO Box 494, Mississippi State MS 39762*. Reader Service number 484.

Paul Grupp KA1LR/4
Casselberry FL

EMC GROUNDING BRAID

The Electric Motion Company of Winsted, Connecticut, has introduced a product to end hams' grounding woes. Their flexible copper braid is equivalent to #6 AWG(!) and is well-tinned to reduce corrosion. It appears to provide about 2.5 times the conductor area of RG-8/U braid traditionally used for grounding. Best of all, it is supplied in 25- and 50-foot coils, banishing forever the dubious privilege of stripping braid from coax.

In Use

We have had the opportunity to install EMC's product in several shacks and in each case were impressed with the material. The braid should be brought into the shack from a good grounding point, with attention paid to keeping its length as short as possible. The braid can be run either behind the equipment desk, with separate pieces attached to each piece of gear, or to a central grounding point to which all equipment is connected. Both methods seem to work satisfactorily. Care should be taken to ground everything in your system: keyer, clock, amplifiers, low-pass filters, power supplies, the works. We used short pieces of braid for this purpose and were pleased with how easy it is to cut and handle.

We encountered some problems in making connections to the braid due to its formidable size and the poor connnection points provided on many pieces of radio equipment. One high-power amplifier from a prominent manufacturer appears to have no ground point at all! A low-pass filter we use also has no ground connection point, although the instruction sheet supplied with it emphasizes the importance of providing it with a good ground. Some manufacturers provide their gear with the so-called five-way binding post, which is suitable only for relatively small-diameter wire (inadequate for rf grounding). In these and similar cases (assuming the chassis is supposed to be at ground), you should drill a hole in the chassis and fit it out with a hefty connection point and a couple of large washers.

Because of the braid's size, soldering to it can be difficult. It serves as a very long heat sink! Our 300-Watt iron clearly was not equal to the task. You'll either need to make purely mechanical connections using nuts and bolts or round up a more formidable source of heat than the one we tried!

Conclusions

While there undoubtedly has been suitable braid commercially available somewhere before, it is encouraging to see a manufacturer making it available directly to the amateur market.

For those who insist on having a shack that they *know* is set up properly, the EMC braid is a must. There is simply no longer any excuse for rf burns or TVI caused by poor connection to ground! The material should also be useful for bonding automobile body and chassis components together to reduce RFI.

For more information, contact the *Electric Motion Company, Inc., 100 Whiting Street, PO Box 626, Winsted CT 06098.* Reader Service number 483.

Paul Grupp KA1LR/4
Casselberry FL

TALKMAN C900 PORTABLE TRANSCEIVER

Standard's Talkman.

Exasperated! It's easy to feel that way when confronted with some of the gadgets produced in the name of progress by the personal communications industry. From glow-in-the-dark CB antennas (you don't have one, do you?) to Bone Fones, there have been some real weirdos. Maybe this helps to explain why I took such delight in the Talkman Model C900, the latest in communications gadgetry from Standard Communications. At last! A gadget that's really worthwhile!

The Talkman is a portable FM transceiver which anyone may operate without a license. Most of the circuitry is contained in a small belt pack measuring just 4" × 2.5" × .75" and weighing a mere 9 ounces. An ultralight headset holds a tiny electric mike, earphone, and whip antenna. Despite its diminutive size, however, the Talkman is not a toy, especially at its suggested $129.95 price tag. The Talkman operates on one of several channels available in the 49.830-49.890 MHz range. Since the rig is sold singly, not in pairs, buyers who hope to do any communicating must be careful to obtain units on the same channel. A letter designation on the back of the belt pack indicates the channel.

Technical Features

Most notably, transmit-receive switching is accomplished using VOX circuitry. This makes operating the Talkman a totally hands-free proposition—a real convenience in many situations. Is this use of VOX a first for a communications device intended for the general public?

A straightforward assemblage of 15 transistors and 4 ICs composes the circuitry of the Talkman. The mode is narrowband FM and, in compliance with Part 15 of the FCC regulations, the transmitter output power is less than 100 mW. On receive, a 0.25-uV signal will break the non-adjustable squelch, and a 0.5-uV signal gives 20 dB of quieting. An ordinary 9-V battery powers the unit. Current drain is 13.5 mA squelched, 70 mA while receiving, and 80 mA in transmit.

Controls on the Talkman are minimal, to say the least, with a pair of three-position slide switches doing it all. One switch turns on the unit and allows selection of low or high earphone volume. The second switch is for VOX sensitivity: low, medium, or high. The higher the setting of this control, the more softly you can speak and still trip the VOX. On the other hand, a lower setting helps to prevent ambient noise from actuating the transmitter.

Does It Work?

Yes, it does. In actual use, the Talkman meets or exceeds the claims made by Standard. With the whip antenna completely deployed, the full 1/4-mile range between units is achieved, although signals are not full quieting. Audio quality is on a par with most amateur hand-helds—not high fidelity, but perfectly OK for spoken communications. The headset is extremely lightweight and a pleasure to use, although the placement of the microphone is extremely important for reliable VOX action. My best results were obtained with the foam windscreen almost touching my lips. One complaint about the headset: The mike boom is a little too short for some adults.

Possibilities

Of course, the proximity of the Talkman's operating frequency to our six-meter ham band led immediately to thoughts of a conversion to 50 MHz. Unfortunately, the Talkmans I tested were not my own, so I was not at liberty to tamper with the innards. A schematic is included with each Talkman, and it appears that altering the operating frequency would not be too difficult. I'm sure it won't be long before we see a few of these little gems on six meters.

In Conclusion

I'd be the last to claim that the Talkman represents any sort of communications breakthrough. Still, for many uses—keeping track of buddies at a hamfest or talking to earthbound helpers from the top of your tower, for example—the Talkman may prove far handier than your handie-talkie. Perhaps we'll begin to see Standard's very convenient headset concept spreading soon to our portable ham rigs. It can't happen too soon for me.

For further information, contact *Standard Communications, PO Box 92151, Los Angeles CA 90009.* Reader Service number 486.

Jeff DeTray WB8BTH
***73 Magazine* Staff**

DX

THE UK SCENE

Last year, my family and I enjoyed a holiday in Florida. We tramped most of the usual tourist paths including the Seaquarium, the Kennedy Space Center, the beaches, the fast food stores (still something of a novelty in England), and, of course, Disney World.

Obtaining a reciprocal license was the easiest of all the jobs necessary in planning my USA visit. A photocopy of my current license together with an official letter confirming that it was still active sent to the FCC brought the necessary document within a few weeks.

When I received the reciprocal license, I realized that the only way I could get some HF operating (not being really interested in VHF) was to visit a local ham. I mentioned to Fred Van Aalst WD4RAF, who lives in Fort Lauderdale, that I was planning a visit to Florida and he kindly invited me to meet with him.

While my family and Fred's XYL, Pearl, did some shopping, I activitated G4EJA/W4. Needless to say, it was on a day when the HF bands were in poor shape and I was unable to make any contact with Europe. I called "CQ DX" on 15 and was answered by a W0. It was a moment before that I realized I was probably as far from him then as I would be at home. There is little point in me describing operating in the US (that would be taking coals to Newcastle, to quote a quaint English proverb).

Jeff Maynard G4EJA operating at the desk of Fred Van Aalst WD4RAF in Ft. Lauderdale, Florida.

The shack of G4EJA showing the RTTY gear with W/K QSL cards in the background.

What might be of interest, however, is the view from this side.

There is no equivalent of the FCC in the United Kingdom. The regulatory body for amateur radio (and for all other aspects of radio) is the Home Office. This is a government body, headed by a Minister (Secretary of State), which looks after, among other things, the police and the maintenance of law and order. The main instrument of control is the Wireless Telegraph Act of 1944 which empowers the Secretary of State to do just about anything. The Home Office is assisted by the Post Office (now known as British Telecom) in such matters as interference suppression and equipment testing.

The first requirement for a license is to pass the Radio Amateur's Examination, known by everyone as the RAE. Sittings for the RAE are held twice each year, usually in May and December, with the results being announced about three months later in each case. The examination paper, which is set by the City and Guilds of London Institute on behalf of the Home Office, is divided into two parts.

Part One deals with licensing conditions and Part Two covers elementary radio theory and operating procedures appropriate to the Radio Amateur Service. For a candidate to be successful, 55% or more of the multiple choice questions must be answered correctly.

An RAE pass slip is all that is required for a "B" license permitting operation at 144 MHz and above (all modes except CW). The "A" or full license for operation on all bands and all modes requires a CW test in addition to passing the theory exam.

The Morse test, which is administered informally by the British Telecom, requires the applicant to send and receive plain text and figure groups at twelve words per minute. Punctuation and procedure signals are not part of the test.

With the license comes a callsign. A particular letter sequence can be asked for and will be given if not already allocated; however, the applicant must wait until that special sequence is ready for issue. The UK callsign system is based on Civil Service logic and is therefore impossible to understand. However, this story would not be complete without a description, so here goes!

The callsign consists of four parts: country identifier, class of license indicator, unique licensee sequence, and optional suffix.

The country identifier is one or two letters at the beginning of the call that indicates that part of the United Kingdom from which the station is currently operating. The prefixes are G—England, GM—Scotland, GI—Northern Ireland, GW—Wales, GD—Isle of Man, GJ—Jersey, and GU—Guernsey.

The country identifier changes when the station moves. Thus if I drive about 25 miles south into the principality of Wales, my callsign becomes GW4EJA/M. This highlights the major difference between UK and USA callsigns; in the UK, the combination of figure and letter sequence (e.g., 4EJA) is unique.

The figure following the country identifier indicates the class of license (except as noted below) as follows: 2,3,4,—A (full) license; 8,6—B (VHF) license.

Some hams from the early days still hold G8 and G6 plus two (e.g., G8AB, G6JM) calls; these are full type-A license holders and are the only way to work these prefixes on HF.

A callsign with a 5 indicates the holder of a reciprocal license.

If I operate from a car, the usual /M is added. The suffix /P is added when operating from a "temporary location" or as a pedestrian. Operating from temporary premises requires the use of the suffix /A (presumed to represent "alternative").

If you understand this all so far, the picture is completed with the GB prefix used for special event stations. Two particular GB callsigns to look out for are GB2RS, the news bulletin station of the Radio Society of Great Britain, and GB2ATG, the RTTY news bulletin station of the British Amateur Radio Teleprinter Group (BARTG).

Having crossed the various bridges to date and obtained a full (A) license, the road is by no means as smooth as it might be. The Wireless Telegraphy Act already mentioned is fraught with problems for the unwary. It is a requirement of the UK amateur license that a licensee must be able to verify that his transmissions are within the authorized frequency band.

It is not permitted in the UK to listen to transmissions other than from authorized broadcast stations and radio amateurs.

The final damping factor is a feature of UK local goverment; it is necessary to obtain "planning permission" for any permanent structure over 10 feet in height. I spent two years battling with my local authority before being allowed (somewhat reluctantly) to erect a tower. Even then the permission was only for a tilt-over and included the rider that it "should be erected for no

OBTAINING A UK RECIPROCAL LICENSE

Citizens of the US intending to visit the United Kingdom may obtain a reciprocal G5 license providing they hold a General, Extra, or Advanced US license (holders of Novice and Technician licenses *cannot* apply even for a UK B-type license).

Applications, on the appropriate form together with a photocopy of the applicant's current license, should be sent to: Amateur Radio Regulatory Dept., The Home Office, Waterloo Bridge House, Waterloo Road, London SE1 8UA.

If a permanent address in the UK can be given, a license for 6 months will be issued; otherwise, a two-month mobile license is given. The current fee is £8. (US $16) for eitner of these. The callsign will be in the series G5O–.

more than 15 daylight hours per week."

So that's a quick look at the UK amateur radio scene. I hope it will contribute something to more and better QSOs across the pond. Any reader lacking a QSO with England is welcome to a sked (write or telex to 628811) on CW, SSB, or RTTY (or even SSTV with some notice), and if you hear me, I am still chasing counties for QCA and I need Wyoming, Utah, Nevada, Montana, Idaho, and Nebraska for WAS!

Finally, thanks again to Fred WD4RAF for his help in introducing me to stateside operating. Any US hams traveling this way are welcome to call.

Jeff Maynard G4EJA
Cheshire, England

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

CLANDESTINE RADIO

This month's column is devoted to clandestine radio. Recent events have once again proved to us that the right of operating free and open radio stations is something we should never take too lightly. Over the years, both amateurs and non-amateurs have suffered when the privilege of unhindered radio communication has been yanked away by autocratic regimes. This month we pay tribute to those brave individuals and groups who have put the public's right to know above their own personal safety.

ELEMENT 1—CROSSWORD PUZZLE
(Illustration 1)

Across

1) Underground user's gear is usually this
7) Attack feared by resistance groups
10) Iranian religion
11) Cuban station—digit
14) 3.1416
15) Bury or understand
17) Morse, Baudot, etc.
18) Direction____________ equipment
21) Where the generals stay
24) A communication device using the sun's rays: ____________ graph
26) Martial law country's prefix
28) US propaganda station (2 words)

Down

2) An interference (abbr.)
3) Audio-visual (abbr.)
4) A banished citizen
5) Prison QTH
6) Favorite Soviet radio activity
7) Commie color
8) Clandestine operators often face this
9) What you are
12) Action of 24 across
13) WWII radio invention
15) Opposite of don't
16) Identification (abbr.)
17) Secret code
19) Press station
20) Opposite of stereo
22) Energy (abbr.)
23) Baudot medium (abbr.)
25) It goes with every pot
27) English tavern

ELEMENT 2—MULTIPLE CHOICE

1) Which nation runs "Radio Peace and Progress"?
1) Soviet Union
2) Panama
3) United States
4) Japan

2) Which of the following is *not* a US military station?
1) WAR
2) WIN
3) NAV
4) AIR

3) An American underground TV station? Well, it happened in Syracuse, New York, in the fall of 1977. What sort of programming did "Lucky 7" provide its surprised viewers?
1) Cartoons
2) Pornographic movies

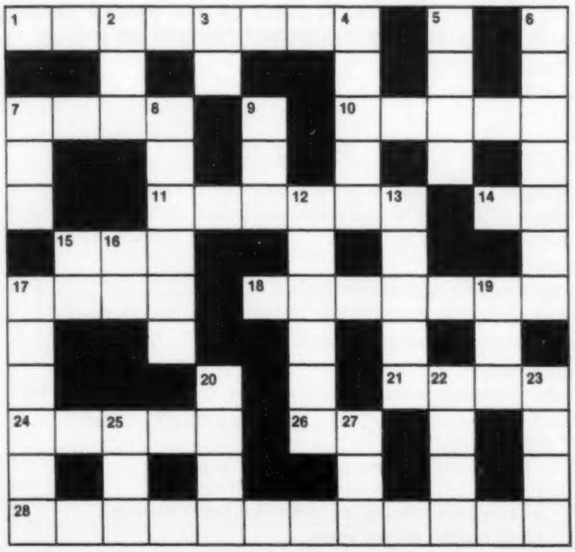


Illustration 1.

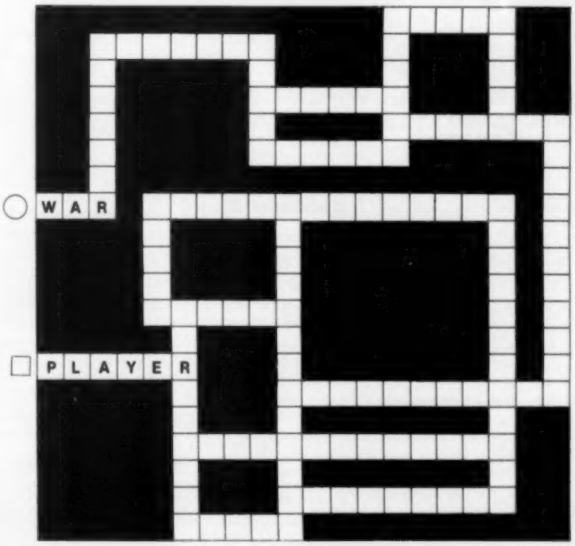


Illustration 2.

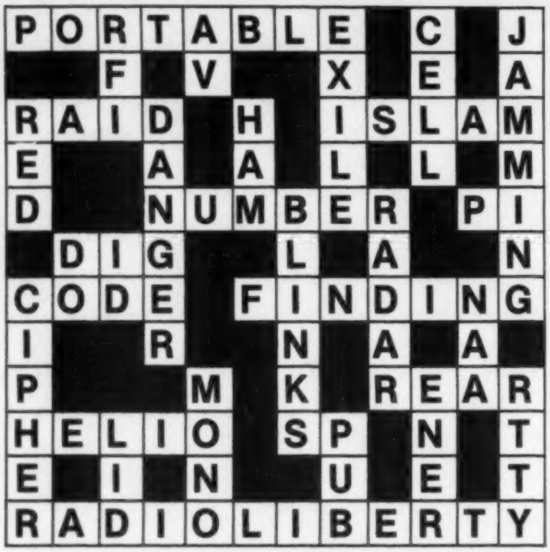


Illustration 1A.

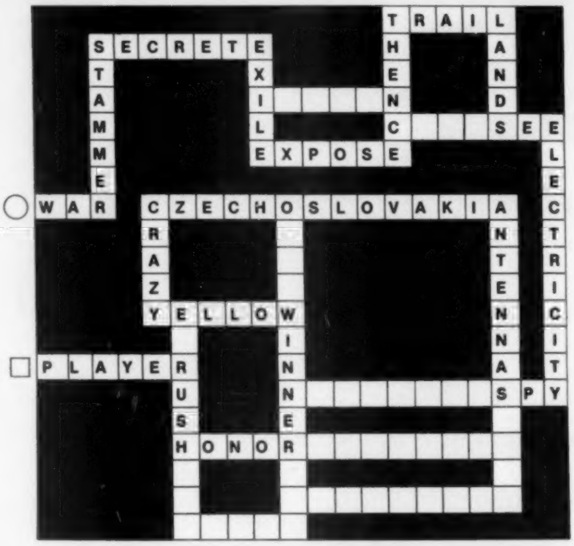


Illustration 2A.

3) Revolutionary propaganda
4) Game shows

4) One of the oldest active clandestine broadcast stations is "Radio Espana Independient." It began operation in:

1) 1920
2) 1941
3) 1954
4) 1975

5) Back in the 1960s, the CIA ran a propaganda station on an obscure Caribbean Island. What was this island's name?

1) Swan Island
2) Hammarlund Island
3) Johnson Island
4) Hallicrafters Island

ELEMENT 3—ALPHABET GAME

Complete the names of the five clandestine broadcast stations listed below by placing letters of the alphabet on every dash. Use each letter only once. The letters J, K, W, X, and Z are not used.

A B C D E F G H I L M N O P Q R S T U V Y

1) VOICE/OF/NA_IB_A
2) VOICE/OF/_A_E_TI_E
3) VOICE/OF/_RE_/_ANAR_/ISL_N_S
4) VOICE/OF/T_E/_AS_UE/_NDER_R_UND
5) VOICE/OF/THE/E_I_REA/RE_OLUTION

ELEMENT 4—HAMAZE
(Illustration 2)

Here's a new type of maze specifically geared to hams. The object is to start at the circle and trace your way to the square by filling in the answers to the clues given below. To help you on the way, we've already given you the first and last clue answers. All words read either vertically downward or from left to right. Each new word is on a *perpendicular* angle to the previous word. Words join on a common letter. Good luck.

1) Organized aggression
2) Stumble speak
3) To hide
4) An organization that may run a clandestine station: ________ group
5) Discreditable revelation
6) From that place
7) A path
8) Disembarks
9) To view
10) Energy often in short supply to underground stations
11) Secret watcher
12) Aerials
13) 1960s Soviet invasion place
14) Nuts
15) One who is chicken
16) Victor
17) Self-respect
18) Hurry
19) One who plays

THE ANSWERS

Element 1:
See Illustration 1A.

Element 2:
1—1 Peacefully progressing toward what? It's the USSR's answer to Radio Free Europe. (They couldn't call it "Radio Enslaved Europe," could they?)
2—2 WIN was a button.
3—2 Pass the popcorn.
4—2 Patience is a virtue.
5—1 How about "Kenwood Island"?

Element 3:
1—VOICE OF NAMIBIA, 2—VOICE OF PALESTINE, 3—VOICE OF FREE CANARY ISLANDS, 4—VOICE OF THE BASQUE UNDERGROUND, 5—VOICE OF THE ERITREA REVOLUTION.

Element 4:
See Illustration 2A.

SCORING

Element 1:
Twenty-five points for the completed puzzle, or 1/2 point for each question correctly answered.

Element 2:
Five points for each correct answer.

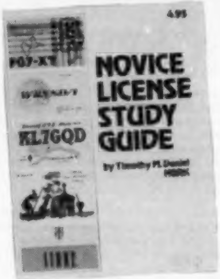
Element 3:
Five points for each correct answer.

Element 4:
Twenty-five points for the completed puzzle, or one point for each word solved.

How'd ya do?
1-20 points—"Is the VOA clandestine?"
21-40 points—Once heard Radio Peking.
41-60 points—Scans the band—but hears nothing.
61-80 points—Single agent.
81-100+ points—Double agent.

RADIO BOOKSHOP

FOR THE NOVICE



NEW, UPDATED EDITIONS OF OUR FAMOUS NOVICE LICENSE STUDY GUIDE AND NOVICE STUDY TAPES

• **NOVICE STUDY GUIDE**—by Timothy M. Daniel N8RK. Here is the most up to date novice guide available. It is complete with information about learning Morse Code, has the latest FCC amateur regulations and the current FCC application forms. This guide *is not* a question/answer memorization course but rather it emphasizes the practical side of getting a ham license and putting a station on the air. It reflects what the FCC expects a Novice to know without page after page of dull theory. The most current information still available at last year's price. SG7357 $4.95.*

• **NOVICE STUDY TAPES**—If you are just getting started in ham radio, you'll find these tapes indispensable! This up-to-the-minute revision of the 73 Study Course is the perfect way to learn everything you need to breeze through the Novice written exam. Theory, FCC regulations, and operating skills are all covered, and you'll be amazed at how fast you learn using these tapes!

Once the test is behind you, these tapes will go right on being useful, because they are packed with the latest information on setting up your own ham station, and getting on the air.

Thousands of people have discovered how easy learning from cassette can be—order now and enter the fascinating world of ham radio! CT7300 Set of 3—$15.95.*

Scientists have proven that you learn faster by listening than by reading because you can play a cassette tape over and over in your spare time—even while you're driving! You get more and more info each time you hear it. You can't progress without solid fundamentals. These three hour-long tapes give you all the basics you'll need to pass the Novice exam easily. You'll have an understanding of the basics which will be invaluable to you for the rest of your life! Can you afford to take your Novice exam without first listening to these tapes?

SPECIAL OFFER! Both Novice License Study Guide and Novice Study Tapes $19.95. Order NP7300.

— General License Study Guide —

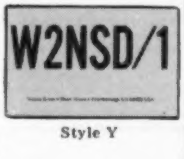
new FROM WAYNE GREEN BOOKS

GENERAL LICENSE STUDY GUIDE—by Timothy M. Daniel N8RK. This is the complete guide to the General License. Learning rather than memorizing is the secret. This is not a question-and-answer guide that will gather dust when the FCC issues a new test. Instead, this book will be a helpful reference, useful long after a ham upgrades to General. Includes up-to-date FCC rules and an application form. Order yours today and talk to the world. SG7358 $6.95

• **ADVANCED CLASS LICENSE STUDY GUIDE**—Ready to upgrade your license? To prevent retaking the FCC theory exam, you need the *73* Advanced theory guide. SSB, antenna theory, transmitters, and electronics measuring techniques are covered in detail in this easy-to-follow study guide. Special modes and techniques, such as RTTY, are also treated. An engineering degree is *not* necessary to master the Advanced theory—try this book before visiting the examiner's office! (Published by TAB Books previous to recent changes in FCC exam material.) SG1081 $6.95.*

FOR YOUR HAMSHACK

• **QSL CARDS**—*73* turns out a fantastic series of QSL cards at about half the cost of having them done elsewhere because they are run as a fill-in between printing books and other items in the 73 Print Shop. 250 Style W—QW0250—for $8.95*; 500 Style W—QW0500—for $13.95*; 250 Style X—QX0250—for $8.95*; 500 Style X—QX0500; 250 Style Y—QY0250—for $8.95*; 500 Style Y—QY0500—for $13.95.* Allow 6-12 wks. for delivery.



Style Y

Style W

Style X

• **LIBRARY SHELF BOXES**—These sturdy white, corrugated, dirt-resistant boxes each hold a full year of *73, Kilobaud Microcomputing or 80 Microcomputing*. With your order, request self-sticking labels for any of the following: *73, Kilobaud Microcomputing, 80 Microcomputing, CQ, QST, Ham Radio, Personal Computing, Radio Electronics, Interface Age*, and *Byte*. Order 1—BX1000—for $2.00*; order 2-7—BX2002—for $1.50 each*; order 8 or more—BX1002—for $1.25 each*.

73 MAGAZINE BINDERS

• Preserve and protect your collection for a lifetime! Order these handsome red binders with gold lettering. $7.50 for 1, 3 for $21.75, 6 for $42.00. (Postpaid within USA, please add $2.50 per order outside USA.) *Check or money orders only, no phone or C.O.D. orders.* **73 Binders, P.O. Box 5120, Philadelphia, PA 19141.**

***NOTE—Above address for Binders only.**

73 CODE TAPES

ANY FOUR TAPES FOR $15.95! $4.95 EACH

"GENESIS"

5 WPM—CT7305—This is the beginning tape for people who do not know the code at all. It takes them through the 26 letters, 10 numbers and necessary punctuation, complete with practice every step of the way using the newest blitz teaching techniques. It is almost miraculous! In one hour many people—including kids of ten—are able to master the code. The ease of learning gives confidence to beginners who might otherwise drop out.

"THE STICKLER"

6+ WPM—CT7306—This is the practice tape for the Novice and Technician licenses. It is made up of one solid hour of code, sent at the official FCC standard (no other tape we've heard uses these standards, so many people flunk the code when they are suddenly—under pressure—faced with characters sent at 13 wpm and spaced for 5 wpm). This tape is not memorizable, unlike the zany 5 wpm tape, since the code groups are entirely random characters sent in groups of five.

"BACK BREAKER"

13+ WPM—CT7313—Code groups again, at a brisk 14 per so you will be at ease when you sit down in front of the steely-eyed government inspector and he starts sending you plain language at only 13 per. You need this extra margin to overcome the panic which is universal in the test situations. When you've spent your money and time to take the test, you'll thank heaven you had this back-breaking tape.

"COURAGEOUS"

20+ WPM—CT7320—Code is what gets you when you go for the Extra class license. It is so embarrassing to panic out just because you didn't prepare yourself with this tape. Though this is only one word faster, the code groups are so difficult that you'll almost fall asleep copying the FCC stuff by comparison. Users report that they can't believe how easy 20 per really is with this fantastic one hour tape.

"OUTRAGEOUS"

25+ WPM—CT7325—This is the tape for that small group of overachieving hams who wouldn't be content to simply satisfy the code requirements of the Extra Class license. It's the toughest tape we've got and we keep a permanent file of hams who have mastered it. Let us know when you're up to speed and we'll inscribe your name in 73's CW "Hall of Fame."

—SSTV TAPE—

• **SLOW SCAN TELEVISION TAPE**—CT7350—Prize-winning programs from the 73 SSTV contest. Excellent for Demo! $5.95.*

BACK ISSUES

• **BACK ISSUES**—Complete your collection; many are prime collectables now, classics in the field! A full collection is an invaluable compendium of radio and electronics knowledge!

733006	73 BACK ISSUE—BEFORE JULY 1980	$ 3.00
73350	73 BACK ISSUE JULY 1980 THRU OCT. 1981	$ 3.50
73350P	73 BACK ISSUE NOV. 1981 TO PRESENT	$ 3.50
73005	73 BACK ISSUE—5 YOUR CHOICE	$10.75
73010	73 BACK ISSUE—10 YOUR CHOICE	$16.00
73025	73 BACK ISSUE—25 YOUR CHOICE	$27.00
73125	73 BACK ISSUE—25 OUR CHOICE	$14.00

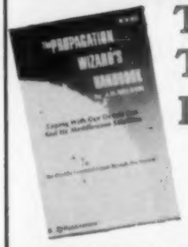
Shipping: Please add $1.00 per magazine. Orders of ten magazines or twenty-five magazines add $7.50 per order.

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to: 73 Radio Bookshop • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.50 handling first book, $1.00 each additional book, $10.00 per book foreign airmail. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address. (Prices subject to change on books not published by 73 Magazine.)

FOR TOLL FREE ORDERING CALL 1-800-258-5473

RADIO BOOKSHOP

THE 73 TECHNICAL LIBRARY



BEHIND THE DIAL
The Challenge of 160!
WORLD PRESS SERVICES FREQUENCIES
THE NEW WEATHER SATELLITE HANDBOOK
new

BEHIND THE DIAL—by Bob Grove. Get more fun out of shortwave listening with this interesting guide to receivers, antennas, frequencies, and interference. BK7307 $4.95.*

THE CHALLENGE OF 160—is the newest book in the *73* technical library, dedicated to 160-meter operating. Si Dunn provides all necessary information to get started on this unique band. The all-important antenna and ground systems are described in detail. The introduction contains interesting photos of Stew Perry's (the King of 160) shack. This reference is a must for new and experienced "Top Band" operators. BK7309 $4.95.*

SSB . . . THE MISUNDERSTOOD MODE—by James B. Wilson. Single Sideband Transmission . . . thousands of us use it every day, yet it remains one of the least understood facets of amateur radio. J. B. Wilson presents several methods of sideband generation, amply illustrated with charts and schematics, which will enable the ambitious reader to construct his own sideband generator. A must for the technically-serious ham. BK7351 $5.50.*

PROPAGATION WIZARD'S HANDBOOK— by J. H. Nelson. When sunspots riddled the worldwide communications networks of the 1940s, John Henry Nelson looked to the planets for an answer. The result was a theory of propagation forecasting based upon interplanetary alignment that made the author the most reliable forecaster in America today. The book provides an enlightened look at communications past, present, and future, as well as teaching the art of propagation forecasting. BK7302 $6.95.*

TOOLS & TECHNIQUES FOR ELECTRONICS—by A. A. Wicks is an easy-to-understand book written for the beginning kit-builder as well as the experienced hobbyist. It has numerous pictures and descriptions of the safe and correct ways to use basic and specialized tools for electronic projects, as well as specialized metal-working tools and the chemical aids which are used in repair shops. BK7348 $4.95.*

FOR THE CONTESTER

THE CONTEST COOKBOOK

THE CONTEST COOKBOOK—reveals the secrets of the contest winners (domestic, DX, and specialty contests), complete with photos and diagrams of equipment used by the top scorers. Find out how to make 150 contacts in one hour. BK7308 $5.95.*

WORLD PRESS SERVICE FREQUENCIES—by Thomas Harrington. Can't wait to hear the evening news, or are you wondering about the news that you *aren't* hearing? Receive by Radio Teletype (RTTY) *all* the world news and financial happenings from the world capitols on a 24 hour a day basis. This book gives you the frequencies and times of broadcast of such news services as AP, UPI, Reuters, TASS, VOA and London Press. Also included is an introduction to RTTY with information on equipment, antennas, abbreviations—everything you need to get started in RTTY. BK1202 $5.95.*

NEW!

THE NEW WEATHER SATELLITE HANDBOOK—by Dr. Ralph E. Taggart WB8DQT. Here is the completely updated and revised edition containing all the information on the most sophisticated and effective spacecraft now in orbit. This book serves both the experienced amateur satellite enthusiast and the newcomer. It is an introduction to satellite watching, providing all the information required to construct a complete and highly effective ground station. Solid hardware designs and all the instructions necessary to operate the equipment are included. For experimenters who are operating stations, the book details all procedures necessary to modify equipment for the new series of spacecraft. Amateur weather satellite activity represents a unique blend of interests encompassing electronics, meteorology and astronautics. Join the privileged few in watching the spectacle of earth as seen from space on your own monitoring equipment. BK7383 $8.95.*

INTERFERENCE HANDBOOK—by William R. Nelson, WA6EQG—This timely handbook covers every type of RFI problem and gives you the solutions based on practical experience. Covers interference to TV, radio, hi-fi, telephone, radio amateur, commercial and CB equipment. Power line interference is covered in depth—how to locate it, cure it, work with the public, safety precautions, how to train RF/I investigators. Written by an RFI expert with 33 years of experience, this profusely illustrated book is packed with practical easy-to-understand information. BK1230 $8.95.*

IC OP-AMP COOKBOOK—by Walter G. Jung. Covers not only the basic theory of the IC op amp in great detail, but also includes over 250 practical circuit applications, liberally illustrated. 592 pages, 5½ x 8½, softbound. BK1028 $14.95.*

OWNER REPAIR OF RADIO EQUIPMENT—by Frank Glass K6RQ. Here's a book that will teach you an approach to troubleshooting without a shack full of test equipment. Written in a narrative, non-mathematical style, it will encourage you to successfully fix your own rig problems 80 to 90% of the time. Even if you don't want to fix, you can learn a lot about how things work and fail. Add to your library and personal expertise. BK7310 $7.95.*

HANDBOOKS FOR THE HAMSHACK

THE TEN METER FM HANDBOOK—by Bob Heil K9EID. This handbook has been published to help the ten meter enthusiast learn more about the many methods of conversions and tricks that are used to make existing units work better. Join the great "tinkerers" of the world on ten FM and enjoy the fantastic amount of fun in communicating with amateur stations worldwide on ten meter FM. BK1190 $4.95.*

THE PRACTICAL HANDBOOK OF AMATEUR RADIO FM REPEATERS—by Bill Pasternak WA6ITF (author of 73 Magazines monthly column "Looking West") This is the book for the VHF/UHF FMer, compiled from material submitted by over a hundred individuals, clubs, organizations and equipment manufacturers. A "must have" for your ham shack shelf. BK1185 $12.95.*

The 73 Test Equipment Library

TEST EQUI LIBR
RADIO FREQUENC TESTERS
IC TEST EQUIPMENT

VOL. I COMPONENT TESTERS—How to build transistor testers (8), diode testers (3), IC testers (3), voltmeters and VTVMs (9), ohmmeters (8 different kinds), inductance (3), capacity (9), Q measurement, crystal checking (6), temperature (2), aural meters for the blind (3), and all sorts of miscellaneous data on meters . . . using them, making them more versatile, making standards. Invaluable book. LB7359 $4.95.*

VOL. II AUDIO FREQUENCY TESTERS—Jam-packed with all kinds of audio frequency test equipment. If you're into SSB, RTTY, SSTV, etc., this book is a must for you . . . a good book for hi-fi addicts and experimenters, too! LB7360 $4.95.*

VOL. III RADIO FREQUENCY TESTERS—Radio frequency waves, the common denominator of amateur radio. Such items as SWR, antenna impedance, line impedance, RF output, and field strength; detailed instructions on testing these items includes sections on signal generators, crystal calibrators, grid dip oscillators, noise generators, dummy loads, and much more. LB7361 $4.95.*

VOL. IV IC TEST EQUIPMENT—Become a troubleshooting wizard! In this fourth volume of the *73* TEST EQUIPMENT LIBRARY are 42 home construction projects for building test equipment to work with your ham station and in servicing digital equipment. Plus a cumulative index for all four volumes for the *73* TEST EQUIPMENT LIBRARY. LB7362 $4.95.*

RF AND DIGITAL TEST EQUIPMENT YOU CAN BUILD—BK1044—Rf burst, function, square wave generators, variable length pulse generators—100 kHz marker, i-f and rf sweep generators, audio osc, af/rf signal injector, 146 MHz synthesizer, digital readouts for counters, several counters, prescaler, microwave meter, etc. 252 pages. BK1044 $5.95.*

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to: 73 Radio Bookshop • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.50 handling first book, $1.00 each additional book, $10.00 per book foreign airmail. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address. (Prices subject to change on books not published by 73 Magazine.)

FOR TOLL FREE ORDERING CALL 1-800-258-5473

RADIO BOOKSHOP

ANTENNA BOOKS

PRACTICAL ANTENNAS FOR THE RADIO AMATEUR—A manual describing how to equip a ham station with a suitable antenna. A wide range of antenna topics, systems, and accessories are presented giving the reader some food for thought and practical data for construction. Designed to aid the experienced ham and novice as well. Only BK1015 $9.95.*

VHF ANTENNA HANDBOOK—The new *VHF Antenna Handbook* details the theory, design, and construction of hundreds of different VHF and UHF antennas . . . a practical book written for the average amateur who takes joy in building, not full of complex formulas for the design engineer. Packed with fabulous antenna projects you can build. BK7368 $5.95.*

73 DIPOLE AND LONG-WIRE ANTENNAS—by Edward M. Noll W3FQJ. This is the first collection of virtually every type of wire antenna used by amateurs. Includes dimensions, configurations, and detailed construction data for 73 different antenna types. Appendices describe the construction of noise bridges, line tuners, and data on measuring resonant frequency, velocity factor, and swr. BK1016 $5.50.*

- **ALL ABOUT CUBICAL QUAD ANTENNAS (2nd edition)—BK1196—The "Classic" on Quad design, theory, construction, and operation. New 2nd edition contains new feed and matching systems and new data. $5.95.***

- **BEAM ANTENNA HANDBOOK (New 5th edition)**—BK1197—Yagi beam theory, construction and operation. Information on wire beams, SWR curves and matching systems. A "must" for serious DXers. $5.95*

- **VHF HANDBOOK FOR RADIO AMATEURS**—BK1198—Contains information on FM theory, operation and equipment, VHF antenna design and construction, satellite-EME, and the newest solid-state circuits. $6.95*

- **THE RADIO AMATEUR ANTENNA HANDBOOK**—BK1199—All about wire antennas, beams, tuners, baluns, coax, radials, SWR and towers. Clear and complete information. $6.95*

- **SIMPLE, LOW-COST WIRE ANTENNAS FOR RADIO AMATEURS**—BK1200—All new data and everything you want to know about low-cost, multi-band antennas, inexpensive beams, "invisible" antennas for hams in "tough" locations. $6.95*

73 Dipole and Long-Wire Antennas
2nd EDITION NEW INFORMATION
ALL ABOUT CUBICAL QUAD ANTENNAS
The Famous Handbook on Quad Theory, Design, Construction and Operation
WILLIAM I. ORR, W6SAI
STUART D. COWAN, W2LX
VHF ANTENNA HANDBOOK
NEW 5TH EDITION!
BEAM ANTENNA HANDBOOK
WORLD Repeater ATLAS Repeater Repeater Repeater
$4.95
Guide to Ham Radio
by Larry Kahaner
The Magic of Ham Radio
$4.95

COOK BOOKS

TTL COOKBOOK—by Don Lancaster. Explains what TTL is, how it works, and how to use it. Discusses practical applications, such as a digital counter and display system, events counter, electronic stopwatch, digital voltmeter and a digital tachometer. BK1063 $9.50.*

CMOS COOKBOOK—by Don Lancaster. Details the application of CMOS, the low power logic family suitable for most applications presently dominated by TTL. Required reading for every serious digital experimenter! BK1011 $10.50.*

TVT COOKBOOK—by Don Lancaster. Describes the use of a standard television receiver as a microprocessor CRT terminal. Explains and describes character generation, cursor control and interface information in typical, easy-to-understand Lancaster style. BK1064 $9.95.*

SPECIAL OFFER
Chart of
UNITED STATES AMATEUR RADIO PRIVILEGES

by class of license, emission type, and frequency from 160 thru 2 meters, including provision for the new 30, 17, and 12 meter bands. This 22 x 28 in, twelve-color chart is the first of its kind to be both informative and decorative. $3.00 value, only $1.95 with the purchase of 1 or more books from the Radio Bookshop. (Supplies limited, order now.) CH7300 $1.95.

THE WELL EQUIPPED HAM SHACK

WORLD REPEATER ATLAS—Completely updated, over 230 pages of repeater listings are indexed by location and frequency. More than 50 maps pinpoint 2000 repeater locations throughout the USA. Foreign listings include Europe, the Middle East, South America, and Africa. $4.95* BK7315

THE MAGIC OF HAM RADIO—by Jerrold Swank W8HXR begins with a brief history of amateur radio and of Jerry's involvement in it. Part 2 details many of ham radio's heroic moments. Hamdom's close ties with the continent of Antarctica are the subject of Part 3. In Part 4 the strange and humorous sides of ham life get their due. And what of the future? Part 5 peers into the crystal ball. $4.95.* BK7312

A GUIDE TO HAM RADIO—by Larry Kahaner WB2NEL. What's Amateur Radio all about? You can learn the basics of this fascinating hobby with this excellent beginner's guide. It answers the most frequently asked questions in an easy-going manner, and it shows the best way to go about getting an FCC license. A Guide to Ham Radio is an ideal introduction to a hobby enjoyed by people around the world. $4.95.* BK7321

WORLD RADIO TV HANDBOOK 1982, 25TH EDITION—This book is the bible of international broadcasters, providing the only authoritative source of exact information about broadcasting and TV stations world wide. This 1981 edition is completely revised, giving comprehensive coverage of short, medium and long wave, 560 pages of vital aspects of world listening. $16.50. BK1184

- **HOW TO DEFEND YOURSELF AGAINST RADAR**—BK1201—by Bruce F. Bogner and James R. Bodnar, a lawyer and radar expert. This book gives you the ammunition to challenge the radar "evidence" that usually leads to a speeding conviction. The major part of the book details the inner workings of radar—you'll become more of an expert than most police officers and judges. The remainder of the book outlines how to defend yourself against a speeding ticket—the observations, measures and testimony you must obtain to defend yourself without the help of a lawyer. The price is a lot less than a fine! $6.95*

MICROCOMPUTER BOOKS FROM 73

How to Build a Microcomputer
...and Really Understand It
$9.95
Some of the Best
microcomputing
MICROCOMPUTERS
40 COMPUTER GAMES
from
microcomputing
Includes Gambling, Racing, Space, Board Games, Card Games, Guessing Games, Puzzles, Calculators, Odds & Ends

- **SOME OF THE BEST FROM KILOBAUD/MICROCOMPUTING**—BK7311—A collection of the best articles that have recently appeared in Kilobaud/ MICROCOMPUTING. Included is material on the TRS-80 and PET systems, CP/M, the 8080/8085/Z80 chips, the ASR-33 terminal. Data base management, word processing, text editors and file structures are covered too. Programming techniques and hardcore hardware construction projects for modems, high speed cassette interfaces and TVTs are also included in this large format, 200 plus page edition. $10.95.*

- **40 COMPUTER GAMES**—BK7381—Forty games in all in nine different categories. Games for large and small systems, and even a section on calculator games. Many versions of BASIC used and a wide variety of systems represented. A must for the serious computer gamesman. $7.95*

- **THE NEW HOBBY COMPUTERS**—BK7340—This book takes it from where "HOBBY COMPUTERS ARE HERE!" leaves off, with chapters on Large Scale Integration, how to choose a microprocessor chip, an introduction to programming, low cost I/O for a computer, computer arithmetic, checking memory boards . . . and much, much more! Don't miss this tremendous value! Only $4.95.*

- **UNDERSTANDING AND PROGRAMMING MICROCOMPUTERS**—BK7382—A valuable addition to your computing library. This two-part text includes the best articles that have appeared in 73 and Kilobaud Microcomputing magazines on the hardware and software aspects of microcomputing. Well-known authors and well-structured text helps the reader get involved. $10.95*

HOW TO BUILD A MICROCOMPUTER—AND REALLY UNDERSTAND IT—by Sam Creason. The electronics hobbyist who wants to build his own microcomputer system now has a practical "How-To" guidebook. This book is a combination technical manual and programming guide that takes the hobbyist step-by-step through the design, construction, testing, and debugging of a complete microcomputer system. Must reading for anyone desiring a true understanding of small computer systems. $9.95.* BK7352

HOBBY COMPUTERS ARE HERE!If you want to come up to speed on how computers work—hardware and software—this is an excellent book. It starts with fundamentals and explains the circuits and the basics of programming, along with a couple of TVT construction projects, ASCII, Baudot, etc. This book has the highest recommendations as a teaching aid. $4.95.* BK7322

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to: 73 Radio Bookshop • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.50 handling first book, $1.00 each additional book, $10.00 per book foreign airmail. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address. (Prices subject to change on books not published by 73 Magazine.)

FOR TOLL FREE ORDERING CALL 1-800-258-5473

List of Advertisers

***Please contact these advertisers directly.**

To receive full information from our advertisers please complete the following postage-paid card.

R.S. No.		Page
2	AEA/Advanced Electronic Applications	39
329	A. R. Technical Products	91
114	ABEX	63
115	A5 ATV Magazine	156
448	Advanced Communications International	31
20	All Electronics	33
*	Alpha Delta Comm.	99
476	Alpha Delta Comm.	133
*	Amateur Electronic Supply	66, 87, 113, 152
331	Amateur-Wholesale Electronics	21
7	American Crystal Supply	154
334	Amidon Associates	97
97	AMP-Letter	154
*	Antenna Bank	71
71	Applied Invention	63
121	ARCO Solar, Inc.	35
*	Associated Radio	74
358	Astron Corp.	47
*	Autek Research	101
469	BG Carl Electronics	65
11	Barker & Williamson	149
26	Bash Educational Services	148
420	Benjamin Michael Industries	106
*	Britt's Two-Way Radio	107
*	Bucks' Rock	66
12	Bullet Electronics	156
*	C & A Roberts	113
92	Ceco Communications, Inc.	91
102	Centurion International	97
321	Certified International	156
89	Clutterfree Modular Consoles	117
*	Code Quick	111
28	Communications Center, NE.	170
382	Communications Concepts, Inc.	153
377	Communications Electronics	176
15	Communications Specialists	19
444	Computer Plus	154
*	Crown Micro Products	153
106	Cushcraft	47
120	Custom Circuit Design	84
*	Dayton Hamvention '82	65
*	Dakota Microwave	65
110	Debco Electronics/Home Cimena	57
307	Debco Electronics	92
17	Dielectric Comm.	47
*	Derrick Electronics, Inc.	93
*	Digital Research Parts	173
425	Doppler Systems	49
*	R. L. Drake Company	9, 113, 132, 148, 149
*	DXpeditions International	91
453	E.G.E., Inc.	78
*	80 Microcomputing	150
483	Electric Motion Co.	122
*	Electronic Equipment Bank	71
447	Electronic Hobby Innovations	76
82	Electronic Recyclers of MA	154
482	Electronic Specialists	133
119	Electronictown, Inc.	99
400	Engineering Consulting	154
85	Faxscan, Inc.	101
439	Ben Franklin Electronics	154
323	Fox-Tango Corp.	153
23	Flesher Corp.	27
116	Friedsham TV Hardware	63
101	G & K Amateur Supply	52
*	Global Electronics	58
417	Gotham Antenna	101
*	Grove Enterprises	99
86	H & R Communications	58
345	Hal Communications	15, 41, 92
31	Hal-Tronix	52
*	Ham Radio Center	157
*	Ham Radio Outlet	3, 105
33	Hamtronics, NY	171
460	Handi-Tek	156
18	Hastings Antenna	51
303	Heath Company	13
479	Heil, Ltd.	132
72	higain Electronics	57
320	Hoosier Electronics	60
316	Hy-Gain Div. of Telex	53
481	Hy-Gain Div. of Telex	132
*	ICOM	Cov II, 43, 118, 119
474	IIX Equipment	152
*	IRL	39
78	Independent Crystal Supply Co.	156
35	Info-Tech	97
445	Instant Software Amateur Radio Programs	147
27	Iscan Engineering	152
25	JJT Distributing	152
38	Jameco Electronics	175
*	Johnson Commercial Services	154
81	KDK Distributing	23
122	KW Control	48
*	Kantronics	48, 105, 133
*	Kenwood	Cov IV, 7
4	Lacue Communications Electronics	114
452	Lewis Construction Co.	65
*	Live Via Satellite, Inc.	63
53	Luly Associates	58
47	MFJ Enterprises	80, 81
480	MFJ Enterprises	132
484	MFJ Enterprises	121
48	MHz Electronics	158-167
477	MLM Associates	132
77	M-Squared Engineering	93
44	Macrotronics, Inc.	100
45	Madison Electronics Supply	49
46	Maggiore Electronics	90
139	Memphis Amateur Radio	100
49	Micro Control Specialties	63
51	Microlog	75
485	Microlog	120
50	Microcraft Corp.	117
52	Mid-Com Electronics	112
308	J. W. Miller Div./Bell Industries	31, 33
*	Mirage	101
318	National Comm. Group	112, 148
412	Nemal Electronics	82
107	North Coast Microwave	58
*	Orbit Magazine	116
*	P. C. Electronics	35, 114
113	Pacific One Corporation	39
*	Palomar Engineers	4, 133, 134
404	P. B. Radio Service	63
421	Phillips Tech Electronics	154
300	Pipo Communications	156
96	Power Gain Systems	91
459	QRO Engineering	153
60	Quest Electronics	168
117	RSE Hamshack	113
21	R. W. D., Inc.	111
315	Radio Activity	90
61	Radio Amateur Callbook, Inc.	117
397	Radio World	117
454	Radiokit	116
105	Radios Unlimited	114
62	Ramsey Electronics	169, 172
54	Robot Research	73
418	Rolin Distributors	48
95	S. G. Roscoe	33
376	SMP	147
65	S-F Amateur Radio Service	116
111	Sceptor Comm., Inc.	58
*	73 Magazine Books	46, 127-129, 146, 150, 151, 152
	Dealers Ad.	151
	Moving	150
	Subscriptions	115, 152
	University Microfilms	152
333	Sentry Mfg. Co.	114
*	Sherwood Engineering	156
112	Sintec Co.	155
*	Skylane Products	156
433	Skytec	149
309	Spacecoast Research Corp.	156
*	Spectronics, Inc.	149, 174
68	Spectrum Communications	79
436	Spectrum International, Inc.	116
486	Standard Communications	123
30	Strux Corp.	152
69	Surplus Electronics Corp.	154
316	Telex Communications, Inc.	53
481	Telex Communications, Inc.	132
109	Tennessee Electronics	63
326	Texas Microtronics	149
118	The Blacksburg Group	17
449	The Ham Shack	107, 116
57	The Tuned Antenna Co.	67
76	Trac Electronics	67
104	Trionyx Industries, Inc.	26
88	Tufts Electronics	88, 89
*	Universal Communications	59, 107
*	Van Gorden Engineering	93
478	Valor	133
311	Vanguard Labs	156
90	VoCom Products Corp.	49
302	W-S Engineering	117, 148
79	Wacom Products	155
103	Wahl Clipper Corp.	99
*	Wessex Publishing Co.	153
108	Xitek Corp.	148
83	Yaesu Electronics Co.	Cov III, 178

73 MAGAZINE

Books, ETC.

To order, complete the following postage-paid card, or itemize your order including detailed credit card information or check and mail to:
73 Magazine/Mail Order Dept./Peterborough NH 03458.

Catalog#	Item	Price
BK1016	73 DIPOLE & LONG WIRE ANTENNAS	$ 5.50

Catalog#	Item	Price
73360	73 BACK ISSUE—BEFORE JULY 1980	$ 3.00
73380	73 BACK ISSUE JULY 1980 THRU OCT. 1981	$ 3.50
73380P	73 BACK ISSUE NOV. 1981 TO PRESENT	$ 3.50
73005	73 BACK ISSUE—5 YOUR CHOICE	$10.75

Add $1.00 per magazine for shipping

Catalog#	Item	Price
73010	73 BACK ISSUE—10 YOUR CHOICE	$16.00
73025	73 BACK ISSUE—25 YOUR CHOICE	$27.00
73125	73 BACK ISSUE—25 OUR CHOICE	$14.00

Add $7.50 per order for shipping.

Catalog#	Item	Price
BK1196	ALL ABOUT CUBICAL QUAD ANTENNAS	$ 5.95
BK1197	BEAM ANTENNA HANDBOOK	$ 5.95
BK7307	BEHIND THE DIAL	$ 4.95
BK7309	CHALLENGE OF 160	$ 4.95
BK1011	CMOS COOKBOOK	$10.50
CT7305	CODE TAPE—5 WPM	$ 4.95
CT7306	CODE TAPE—6 + WPM	$ 4.95
CT7313	CODE TAPE—13 + WPM	$ 4.95
CT7320	CODE TAPE—20 + WPM	$ 4.95
CT7325	CODE TAPE—25 + WPM	$ 4.95
CT7394	CODE TAPES (ANY FOUR ABOVE)	$15.95
BK7308	THE CONTEST COOKBOOK	$ 5.95
BK7381	40 COMPUTER GAMES	$ 7.95
SG7358	GENERAL LICENSE STUDY GUIDE	$ 6.95
BK7304	GIANT BOOK OF AMATEUR RADIO ANTENNAS	$12.95
BK7321	A GUIDE TO HAM RADIO	$ 4.95
BK7322	HOBBY COMPUTERS ARE HERE	$ 4.95
BK7325	HOW TO BUILD A MICROCOMPUTER & REALLY UNDERSTAND IT	$ 9.95
BK1201	HOW TO DEFEND YOURSELF AGAINST RADAR	$ 6.95
BK1028	IC OP AMP COOKBOOK	$12.95
BK1230	INTERFERENCE HANDBOOK	$ 8.95
BK7312	MAGIC OF HAM RADIO	$ 4.95
BK1033	MASTER HANDBOOK OF HAM RADIO CIRCUITS	$ 8.95
BK7340	THE NEW HOBBY COMPUTERS	$ 4.95
BK7383	THE NEW WEATHER SATELLITE HANDBOOK	$ 8.95
CT7300	NOVICE THEORY TAPES	$15.95
BK7310	OWNER REPAIR OF RADIO EQUIPMENT	$ 7.95
BK7305	POWER SUPPLY HANDBOOK	$ 9.95
BK1015	PRACTICAL ANTENNAS FOR THE RADIO AMATEUR	$ 9.95
BK1185	THE PRACTICAL HANDBOOK OF FM REPEATERS	$ 9.95
BK7302	PROPAGATION WIZARD'S HANDBOOK	$ 6.95
QW0250	QSL CARDS—STYLE W—250	$ 8.95
QW0500	QSL CARDS—STYLE W—500	$13.95
QX0250	QSL CARDS—STYLE X—250	$ 8.95
QX0500	QSL CARDS—STYLE X—500	$13.95
QY0250	QSL CARDS—STYLE Y—250	$ 8.95
QY0500	QSL CARDS—STYLE Y—500	$13.95
BK1199	THE RADIO AMATEUR ANTENNA HANDBOOK	$ 6.95
BK1044	RF & DIGITAL TEST EQUIPMENT	$ 5.95
BK1059	RTL COOKBOOK	$ 6.50
BX1000	SHELF BOX—1	$ 2.00
BX1001	SHELF BOXES—2-7	$1.50 each
BX1002	SHELF BOXES—8 AND UP	$1.25 each
BK1200	SIMPLE, LOW COST WIRE ANTENNAS FOR RADIO AMATEURS	$ 6.95
BK7311	SOME OF THE BEST FROM KILOBAUD	$10.95
BK7311	SOME OF THE BEST	$ 7.95
BK7351	SSB THE MISUNDERSTOOD MODE	$ 5.50
CT7350	SSTV TAPE	$ 5.95
SG1081	STUDY GUIDE—ADV. CLASS	$ 6.95
SG1080	STUDY GUIDE—EXTRA CLASS	$ 5.95
SG7357	STUDY GUIDE—NOVICE CLASS	$ 4.95
BK1190	THE TEN METER FM HANDBOOK	$ 4.95
LB7359	TEST EQUIP LIB V1—COMPONENT TESTERS	$ 4.95
LB7360	TEST EQUIP LIB V2—AUDIO TESTERS	$ 4.95
LB7361	TEST EQUIP LIB V3—RADIO EQUIP.	$ 4.95
LB7362	TEST EQUIP LIB V4—IC TEST EQ.	$ 4.95
BK7348	TOOLS & TECHNIQUES	$ 4.95
BK1063	TTL COOKBOOK	$ 9.50
BK1064	TVT COOKBOOK	$ 9.95
BK7362	UNDERSTANDING & PROGRAMMING MICROCOMPUTERS	$10.95
CH7300	U.S. AMATEUR RADIO CHART	$1.95
BK1069	VERTICAL BEAM & TRIANGLE ANTNS	$ 5.50
BK7368	VHF ANTENNA HANDBOOK	$ 5.95
BK1198	VHF HANDBOOK FOR RADIO AMATEURS	$ 6.95
BK7370	WEATHER SATELLITE HANDBOOK	$ 2.50
BK1202	WORLD PRESS SERVICE FREQUENCIES	$ 5.95
BK1184	WORLD RADIO TV HANDBOOK	$16.50
BK7315	WORLD REPEATER ATLAS	$ 4.95

READER SERVICE

Please help us to bring you a better magazine— by answering these questions.

A. What is your education?
- ☐ 1. High School
- ☐ 2. Some College
- ☐ 3. College Graduate
- ☐ 4. Post Graduate

B. What is your yearly income?
- ☐ 1. Less than $10,000
- ☐ 2. $10,000-$15,000
- ☐ 3. $15,000-$20,000
- ☐ 4. $20,000-$25,000
- ☐ 5. $25,000-$30,000
- ☐ 6. More than $30,000

C. How much have you spent on amateur radio in the last 12 months?
- ☐ 1. Less than $100
- ☐ 2. $100-$800
- ☐ 3. $801-$2,000
- ☐ 4. $More than $2,000

D. What brand(s) of antenna(s) do you own?
- ☐ 1. AEA
- ☐ 2. Antenna Specialists
- ☐ 3. Avanti
- ☐ 4. B & W
- ☐ 5. Bassette
- ☐ 6. Bilal
- ☐ 7. Butternut
- ☐ 8. Cushcraft
- ☐ 9. Dalwa
- ☐ 10. FBFT Tonna
- ☐ 11. Gem
- ☐ 12. Gotham
- ☐ 13. Heath
- ☐ 14. Hustler
- ☐ 15. Hy-Gain
- ☐ 16. Kirk
- ☐ 17. KLM
- ☐ 18. Kreco
- ☐ 19. Larsen
- ☐ 20. Lunar
- ☐ 21. Mor-Gain
- ☐ 22. Mosley
- ☐ 23. Skylane
- ☐ 24. Stewart
- ☐ 25. Telrex
- ☐ 26. TET
- ☐ 27. Van Gordon
- ☐ 28. Western Electronics
- ☐ 29. Wilson
- ☐ 30. Other ____________

E. What brands of HF and VHF equipment do you own?
- ☐ 1. Azden
- ☐ 2. Clegg
- ☐ 3. Collins
- ☐ 4. Drake
- ☐ 5. Heath
- ☐ 6. Hy-Gain
- ☐ 7. Icom
- ☐ 8. KDK
- ☐ 9. Kenwood
- ☐ 10. KLM
- ☐ 11. Melco
- ☐ 12. NCG
- ☐ 13. Santec
- ☐ 14. Swan Cubic
- ☐ 15. Tempo
- ☐ 16. Ten-Tec
- ☐ 17. Wilson
- ☐ 18. Yaesu
- ☐ 19. Other ____________

F. Are you now on RTTY?
- ☐ 1. Yes
- ☐ 2. No

G. If not, are you interested in getting RTTY?
- ☐ 1. Yes
- ☐ 2. No

H. Would you favor a no-code license if ham clubs were placed in charge of licensing?
- ☐ 1. Yes
- ☐ 2. No

I. Would you like to see articles on satellite TV in *73*?
- ☐ 1. Yes
- ☐ 2. No

J. Which of these magazines do you read regularly?
- ☐ 1. *73*
- ☐ 2. *Ham Radio*
- ☐ 3. *QST*
- ☐ 4. *World Radio*
- ☐ 5. *Popular Electronics*
- ☐ 6. *Radio Electronics*
- ☐ 7. *CQ*

K. How many people read your copy of *73*?
- __ 1. 1
- __ 2. 2
- __ 3. 3
- __ 4. 4
- __ 5. 5
- __ 6. 6 or more

Reader Service: Return this card to receive full information on the products advertised in this issue. Refer to the ad. You will find numbers near the logo of each advertiser. Each represents the advertiser's individual Reader Service Number. Circle the corresponding numbers on the card on this page, include your name, address & zip, and drop in a mailbox. In 4-6 weeks you'll hear from the advertiser directly.

This card is valid until May 31, 1982

If you are not a subscriber, please circle 500

1	6	11	16	21	126	131	136	141	146	251	256	261	266	271	376	381	386	391	396
2	7	12	17	22	127	132	137	142	147	252	257	262	267	272	377	382	387	392	397
3	8	13	18	23	128	133	138	143	148	253	258	263	268	273	378	383	388	393	398
4	9	14	19	24	129	134	139	144	149	254	259	264	269	274	379	384	389	394	399
5	10	15	20	25	130	135	140	145	150	255	260	265	270	275	380	385	390	395	400
26	31	36	41	46	151	156	161	166	171	276	281	286	291	296	401	406	411	416	421
27	32	37	42	47	152	157	162	167	172	277	282	287	292	297	402	407	412	417	422
28	33	38	43	48	153	158	163	168	173	278	283	288	293	298	403	408	413	418	423
29	34	39	44	49	154	159	164	169	174	279	284	289	294	299	404	409	414	419	424
30	35	40	45	50	155	160	165	170	175	280	285	290	295	300	405	410	415	420	425
51	56	61	66	71	176	181	186	191	196	301	306	311	316	321	426	431	436	441	446
52	57	62	67	72	177	182	187	192	197	302	307	312	317	322	427	432	437	442	447
53	58	63	68	73	178	183	188	193	198	303	308	313	318	323	428	433	438	443	448
54	59	64	69	74	179	184	189	194	199	304	309	314	319	324	429	434	439	444	449
55	60	65	70	75	180	185	190	195	200	305	310	315	320	325	430	435	440	445	450
76	81	86	91	96	201	206	211	216	221	326	331	336	341	346	451	456	461	466	471
77	82	87	92	97	202	207	212	217	222	327	332	337	342	347	452	457	462	467	472
78	83	88	93	98	203	208	213	218	223	328	333	338	343	348	453	458	463	468	473
79	84	89	94	99	204	209	214	219	224	329	334	339	344	349	454	459	464	469	474
80	85	90	95	100	205	210	215	220	225	330	335	340	345	350	455	460	465	470	475
101	106	111	116	121	226	231	236	241	246	351	356	361	366	371	476	481	486	491	496
102	107	112	117	122	227	232	237	242	247	352	357	362	367	372	477	482	487	492	497
103	108	113	118	123	228	233	238	243	248	353	358	363	368	373	478	483	488	493	498
104	109	114	119	124	229	234	239	244	249	354	359	364	369	374	479	484	489	494	499
105	110	115	120	125	230	235	240	245	250	355	360	365	370	375	480	485	490	495	500

Name ____________________

Address ____________________

City ____________________ State ________ Zip ________

73 Magazine • April 1982

BOOKS

73 Magazine, Pine Street, Peterborough, N.H. 03458

Please send me the following 73 products:

Qty.	Catalog #	Title	Unit Price	Total

Shipping/handling ________

Total ________

Please allow 4-6 weeks for delivery.
No C.O.D. orders accepted.

Enclosed $ __________ ☐ Check ☐ M.O.

Bill: ☐ AE ☐ MC ☐ Visa

Card # ____________________ Exp. date ________

Signature ____________________ Interbank # ________

Name ____________________

Address ____________________

City ____________________

State ____________________ Zip ____________________

Shipping and handling charges:
$1.50 1st book, $1.00 each additional book
(UPS, use street address)
$10.00 each book overseas airmail

4–82

SUBSCRIPTION

73 Magazine P.O. Box 931 Farmingdale, N.Y. 11737

73 subscribers save 30% off the newsstand price.

☐ New subscription ☐ Renewal ☐ 1 year $19.97

Enclosed $ __________ ☐ Check ☐ M.O.

Bill: ☐ MC ☐ Visa ☐ AE ☐ me

Card # ____________________ Exp. date ________

Signature ____________________ Interbank # ________

Name ____________________

Address ____________________

City ____________________ State ________ Zip ________

Canadian—$27.97 1 year U.S. funds only
Foreign surface—$44.97 1 year U.S. funds only
Foreign airmail—please inquire

324B69

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT #29 P. O. BOX 326, DALTON MA 01226

POSTAGE WILL BE PAID BY ADDRESSEE

73 MAGAZINE
P.O. Box 326
Dalton, MA 01226-0326

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO 73 PETERBOROUGH NH 03458

POSTAGE WILL BE PAID BY ADDRESSEE

73 MAGAZINE
Subscription Dept.
POB 931
Farmingdale NY 11737

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO 73 PETERBOROUGH NH 03458

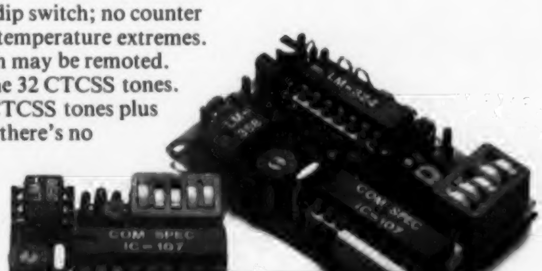
POSTAGE WILL BE PAID BY ADDRESSEE

73 MAGAZINE
Att. Mail Order
Peterborough
NH 03458

LM-358
COM SPEC
IC-107
LM-324
COM SPEC
IC-107
LM-358

A fresh idea!

Our new crop of tone equipment is the freshest thing growing in the encoder/decoder field today. All tones are instantly programmable by setting a dip switch; no counter is required. Frequency accuracy is astonishing ±.1 Hz over all temperature extremes. Multiple tone frequency operation is a snap since the dip switch may be remoted. Our TS-32 encoder/decoder may be programmed for any of the 32 CTCSS tones. The SS-32 encode only model may be programmed for all 32 CTCSS tones plus 19 burst tones, 8 touch-tones, and 5 test tones. And, of course, there's no need to mention our one day delivery and one year warranty.


LM-358
LM-324
COM SPEC
IC-107
COM SPEC
IC-107

COMMUNICATIONS SPECIALISTS

426 West Taft Avenue, Orange, California 92667
(800) 854-0547 / California: (714) 998-3021

✔ 15

SS-32 $29.95, TS-32 $59.95

NEW PRODUCTS

DRAKE'S NEW TRANSCEIVER AND RECEIVER

The R. L. Drake Company has announced new models of its TR7 communications transceiver and R7 receiver. Features new to the TR7A include standard 9-kHz receive selectivity for AM reception, 500-Hz crystal filter for CW reception, built-in noise blanker, improved lightning protection, and a new phone-patch audio input.

The new R7A receiver features a noise blanker, 500-Hz CW crystal filter, and 9-kHz AM selectivity. These units also interconnect to make a "twins" system, offering complete frequency flexibility and dual simultaneous receive. The TR7A has a suggested price of $1699 and the R7A lists for $1649.

For more information, contact *R. L. Drake Company, 540 Richard Street, Miamisburg OH 45342; (513)-866-2421.*

SEVEN-ELEMENT TRIBANDER

A new tribander, the TH7DX, is now available from Hy-Gain. The TH7DX features a dual-driven element system that maintains a vswr of less than 2:1 on all bands including the entire 10-meter band. The driven elements utilize Hy-Gain's Hy-Q traps capable of handling power levels well in excess of the legal limit. These traps allow element lengths of 0.225 wavelength on 10 meters, 0.203 wavelength on 15 meters, and 0.185 wavelength on 20 meters. The dual-driven elements are fed directly with Hy-Gain's 50-Ohm BN-86 balun.

Tests show average front-to-back ratios of 22 dB on 20 and 15 meters, and 17 dB on 10 meters. The average half-power beamwidth varies from 66 degrees on 20 meters to 63 degrees on 10 meters. With a turning radius of 20 feet and the longest element 31 feet, the antenna is no larger than the Hy-Gain TH6DXX. The TH7DX weighs 75 lbs., has 9.4 square feet of wind surface area, and wind loading of 240 lbs. at 80 mph. The TH7DX, complete with stainless steel hardware, balun, and boom-to-mast clamp, is priced at $499.95.

Hy-Gain also has announced that kit model 392S is available to convert the older TH6DXX to a TH7DX configuration for a suggested net of $199.95.

For more information on these products, contact *Hy-Gain Division, Telex Communications, 9600 Aldrich Ave. So., Minneapolis MN 55420; (612)-884-4051.* Reader Service number 481.

INDUCTIVE MODEM

MFJ Enterprises has introduced their new MFJ-1230 originate/answer modem. The 1230 uses an inductive coupling technique for receiving. This gives reliable data transfer by eliminating errors caused by room noise, vibration, and other acoustic-coupling problems.

This Bell 103-compatible modem operates from 0 to 300 baud, features half- and full-duplex operation, and is crystal-controlled for high stability. An Apple version that plugs into the game port (MFJ-1231) is also available, complete with software.

The MFJ-1230 and MFJ-1231 inductive-coupled modems are available for $129.95 and $139.95 respectively.

For more information, contact *MFJ Enterprises, 921 Louisville Rd., Starkville MS 39759; (601)-323-5869.* Reader Service number 480.

H-8 AND H/Z-89 PROGRAM

MLM Associates now offers a Morse code transceiver program for Heath/Zenith H-8 and H/Z-89 owners interested in digital communications. MLM Morse converts International Morse code from a receiver into an alphanumeric video display and changes characters typed at a terminal into the form needed to activate a transmitter or code-practice oscillator. Features include fast break-in CW operation, automatic switching between transmit and receive, and a split-screen display.

The instruction manual gives details for building a CW-to-computer interface or you can use a RTTY modem. MLM also offers the MFJ-1200 computer interface. The software package sells for $29.95. A complete package including software, interface, and power supply is $99.95.

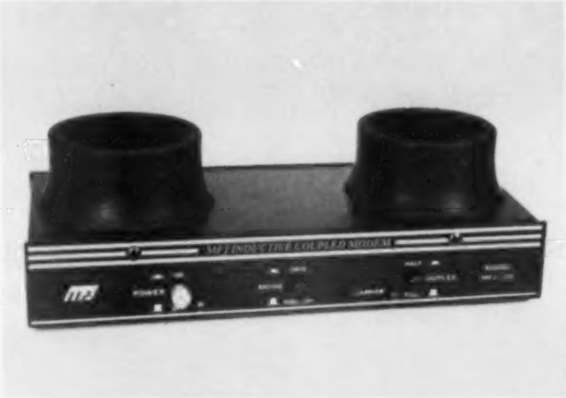
To order, or for more information, contact *William S. Hall, MLM Associates, 5621 Maple Heights Court, Pittsburgh PA 15232; (412)-683-4742.* Reader Service number 477.

MICROPHONE EQUALIZER

The first in a series of new products from Heil, Ltd., is their EQ 200 Microphone Equalizer for speech applications with SSB and FM transmitters. The EQ 200 allows you to equalize your amateur station in a manner similar to the technique used by broadcast stations and recording studios.

This battery-powered device measures 4" × 4" × 1-1/2" and plugs into the microphone line. The three controls, mike gain, low-frequency adjust, and high-frequency adjust are set with

The Drake TR7A transceiver (top) and R7 receiver.



The MFJ inductive-coupled modem.

the aid of a second receiver or another station. Distortion level is 0.09%. Microphones of any impedance will work, but low-impedance microphones are recommended since they usually offer better RFI protection. The EQ 200 costs $49.95.

For more information, contact *Heil, Ltd., #2 Heil Dr., Marissa IL 62257.* Reader Service number 479.

SURGE PROTECTORS

Alpha Delta Communications' Transi-Trap Surge Protectors are gas surge arresters designed to protect sensitive electronic equipment from damage due to excessive voltages or currents generated by transient phenomena. The elements in the Arc-Plug™ cartridge are constructed of two metal electrodes hermetically sealed in a gas-filled ceramic cylinder. They perform as voltage-dependent switches which can reliably and repeatedly carry large currents for brief periods of time.

Alpha Delta Transi-Trap Protectors are designed for indoor installation at the rear of the equipment. If outdoor use is planned, it will be necessary to coat all surfaces thoroughly with a good sealer. The Model R-T low-level protector is designed for use with solid-state receivers, transceivers, or transmitters that run up to 200 Watts into 50 Ohms. It costs $29.95. The Model HV high-voltage protector is for use with linear amplifiers running up to two kW into 50 Ohms and sells for $32.95.

For more details, contact *Alpha Delta Communications, 116A North Main St., Centerville OH 45459; (513)-435-4772.* Reader Service number 476.

R-T
ALPHA DELTA COMMUNICATIONS
AA
TRANSI-TRAP
SURGE PROTECTOR
Made in U.S.A.
HV

Transi-Trap gas surge protectors.

CW-TO-RTTY CONVERTER

Kantronics is introducing a RTTY send/receive device that converts CW from any keyer or keyboard into standard AFSK two-tone RTTY or two-tone CW ID. Micro-RTTY sends and receives at 60, 67, 75, and 100 wpm, plus 110-baud ASCII.

Features include special CW characters for sending a line-return/carriage-feed character and a print attachment. Micro-RTTY receives any shift of RTTY and displays the message on a ten-character, 3/8"-high vacuum-tube fluorescent display. The 2-1/2" × 5" × 5-1/2" package comes with a 9-volt dc power supply and has a suggested price of $299.95.

For more details, contact *Kantronics, 1202 E. 23rd St., Lawrence KS 66044; (913)-842-7745.*

POWER LINE INTERRUPTER

Electronic Specialists now offers an automatic-reset ac power line interrupter. Should the ac line voltage be disrupted or exceed preset safety limits, the power interrupter disconnects ac power from controlled apparatus. A 4-minute timer delay, followed by automatic reset, helps avoid wide voltage fluctuations.

Intended to operate unattended for long periods, the self-reset power interrupter also offers an optional voltage monitor. Connecting to the ac line with a standard 3-prong plug, the power interrupter can accommodate a 15-Ampere resistive load or a 10-Ampere inductive load. The Model PI-SR-15 interrupter costs $185.95; the voltage monitor option costs $20.00 extra.

POWER
LO
OK
HI
VOLTAGE
OFF
OPERATE
FAST
START
POWER INTERRUPTER
Self Reset/Voltage Monitor
Electronic Specialists, Inc.

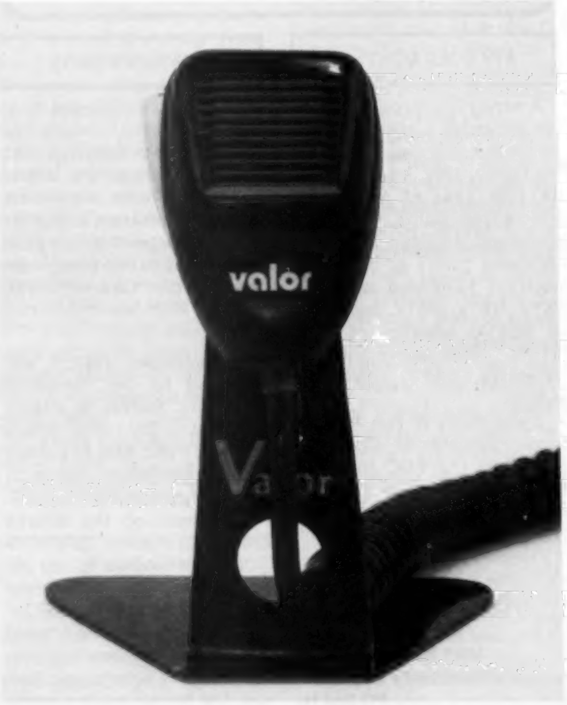
Electronic Specialists' power line interrupter.

For more information, contact *Electronic Specialists, 171 South Main St., Natick MA 01769; (617)-655-1532.* Reader Service number 482.

MIKE STAND

Your mobile microphone can now be turned into a base station unit with Valor Enterprises' new Big Ben mike stand. The Model 221 features a black finish and costs $5.90. A chrome version, Model 221C, is also available for $7.90.

To order, or for more information, write to *Valor Enterprises, West Milton OH 45383; (513)-698-4195.* Reader Service number 478.



The Big Ben mike stand.

COMPACT ANTENNA BALUNS

Palomar Engineers is introducing a new series of baluns. The Model PB series will match

GND
Model
PB-1.5
OUT
IN
OUT

Palomar Engineers' antenna balun.

50-Ohm coaxial cable to 50-, 75-, 100-, 150-, 200-, 250-, 300-, 375-, 450-, 600-, or 800-Ohm balanced antennas. They also can be used as matching transformers for various purposes.

The Model PB series work at power levels to 350 Watts PEP and are 1-1/2" × 3/4" × 3/4" in size. They operate from 1.7 to 30 MHz, are fully encapsulated, and have stainless steel hardware. The PB baluns sell for $14.95.

For further information, contact *Palomar Engineers, 1924-F W. Mission Rd., Escondido CA 92025; (714)-747-3343.*

OFF ON
Palomar Engineers
VLF Converter

Palomar Engineers' VLF converter.

VLF CONVERTERS

Palomar Engineers is introducing two new converters for the 10-500-kHz band. They add reception of weather, ship-to-shore CW traffic, RTTY, WWVB, navigation beacons, 1750-meter no-license band, and European low-frequency broadcast stations.

Model VLF-A converts to 3510-4000 kHz for use with ham receivers and transceivers. Model VLF-S converts to 4010-4500 kHz for general-coverage shortwave receivers. With digital readout, the last three digits read frequency.

The new converters feature antenna bypass when turned off, LED power indicator, and low-current, nine-volt dc operation. The VLF-A and VLF-S sell for $79.95.

For further information, contact *Palomar Engineers, 1924-F W. Mission Rd., Escondido CA 92025; (714)-747-3343.*

LETTERS

ATV GOES MONTHLY

Amateur Television Magazine has expanded publication to 12 issues per year beginning with the March, 1982, issue. Now in its 15th year of service to specialized communications operators, *Amateur Television Magazine* covers all modes of amateur television such as FSTV, NBTV, MSTV, and SSTV as well as coverage of FAX, RTTY, microwave, EME, satellites, CATV, and computers.

It was Henry B. Ruh KB9FO, former publisher of *ATV*, who petitioned the FCC to allow SSTV operation in the HF General Class phone segments. This proposal was adopted and is expected to become effective sometime in early 1982, giving a tremendous boost to SSTV activity.

Mike Stone WB0QCD
Publisher, *ATV Magazine*
PO Box H
Lowden IA 52255

CHARLIE IS BORN

I just read "Messages From Station Charlie," which appeared in the January, 1982, issue of *73*. It was well written and brought back many memories, some pleasant and others I'd rather forget. Perhaps other readers may be interested in the genesis of "Charlie"—station 53C.

In September, 1942, I was assigned to the Office of Strategic Services (OSS), Washington DC. After indoctrination, I was sent to London to confer with [Major General Sir Colin] Gubbins and [Brigadier F. W.] Nichols of the British Special Operations Executive (SOE) with respect to the establishment of an American station to supplement British stations 53A and 53B. The original concept was that we would handle the agent circuits into Norway. The British would arrange for us to get the land required and would furnish Ministry of Works personnel to do the construction, and we would provide the equipment and manpower.

The first thing I did was to drive out London's Great West Road with a receiver, stopping here and there at likely-looking spots to check reception conditions. I saw a road leading up a hill and found myself in a farm worked by Italian prisoners. They doffed their caps and opened gates so I could reach the top of the hill where I found a very large flat area, with low noise level and good reception.

Since throughout England all place-name signs had been removed from roads and railroad stations and buildings, I mapped my route from London to the site with the names of pubs (e.g., Compleat Angler) so that I could identify where I had been when I got back to London!

I am envious of the author's good fortune in meeting those former agents aboard the *Gripsholm*. In my case, I met only one after the war. His name was Robert, and I spent a lovely evening with him and his mother at their home in Paris.

G. L. Graveson K4JI
CDR, USNR (Ret.)
Plantation FL

BINARY STIMULATION

I never write to editors, but had to make an exception in order to respond to your comments concerning CW in your January editorial. The concept of high-speed, computer-based radio communication is definitely an intriguing one, but I must observe that nothing matches Morse code for versatility or CW for simple rf communication.

The average human mind, trained in the use of the code, can interpret the variations in a binary-state stimulus, deriving through that process the information being encoded by the sender. The sender can encode the vast range of human thought that has been or can be reduced to words of human language. I believe the development of the code to be one of mankind's most magnificent achievements.

What do you suggest replacing it with? I know next to nothing about BASIC or other computer languages, but I do know enough to doubt that anyone can communicate with it using an rf oscillator keyed by touching a couple wires together, as many hams have done at one time or another. As an example of versatility of the *type* of binary system used for transmission, consider the feat of surreptitious communication pulled off by Jeremiah Denton when "interviewed" by his North Vietnamese captors: Using the code, he spelled out the word TORTURE using eyeblinks as the binary system. What computer language would offer such a possibility?

I'm not sure that these comments constitute sufficient reason for the code to be retained as one of the hallmarks of the radio amateur, but radio amateurs are usually people who are intrigued by the notion of action at a distance. The idea of communication over vast distances via an insensible medium is one of the things that "hooks" us on this hobby, and the code makes the medium useful with the least moving parts, which I interpret as being efficient. I sincerely believe that it should not be replaced by a system which requires complex contrivances to access that medium.

R.D. Barnum, D.M.D.
Tahlequah OK

Hi, Ray—It's good to hear from one of the "let's go back to smoke signals" crowd. I don't know what band you operate, Ray, but on most of the CW bands I listen to I do not hear a vast range of human thought being expressed, just the usual garbage of name, location, signal strength, my rig is . . . and 73. Ad infinitum. The code is merely a way to send characters, not thoughts. The characters . . . the same ones we use on our typewriters and that more and more hams are using for code generation (if you've noticed the ads for code-typing systems) . . . can be used to communicate words. The words eventually, in some cases, can be used to communicate thought. No one wants to change that. But it was not my suggestion that amateurs stop using CW; that's a straw man of your construction. I've suggested that we stop making newcomers hate CW by jamming it down their throats. I've tried to point out that anyone who thinks that the code test is keeping out undesirables is blind to what has happened.— Wayne.

TEETHING ON CW

The first thing I turn to when *73 Magazine* arrives each month is "Never Say Die." In spite of your caustic comments about the FCC and *QST*, it makes good reading.

Over the past few months you've bored me somewhat, talking about your business acumen, your contact with the avant-garde of amateurs, your DX operations, plus miscellaneous other achievements. Oh, and your dislike of CW.

Wayne, I cut my teeth on CW in the early thirties when that band was only CW. I've continued in my devotion to CW. Man, it's a language; you have to talk it to retain your ability. I was a Navy Radioman on CW during all of WWII. Early in my ham career I made one 75-meter phone contact. I had mike fright so bad that it wasn't until the early fifties that I got on phone again. Now I spend about 50% of my operating time on SSB.

Being something of an underachiever ham, I sincerely appreciate your fighting spirit, Wayne. As you requested, here are some thoughts about our hobby's social events.

A repeater group has a monthly get-together with wives and children at a local restaurant. For each ham, it's an ego trip. And there are picture-takers and practical jokers. Some are neat; others are slobs. Some act educated; some don't. It's a strange cross-section of humanity, all united by the bond of amateur radio. This group conducts no business. The members simply accept the pleasure of each other's company. The wife and I go as often as we can.

I have been a member of my local club, the Shawnee Amateur Radio Club, for several years. The part of the meeting I always enjoy is the free discussion prior to the business meeting. This is the time I meet and enjoy personal contacts with the local hams. Business meetings are a drag. I'd prefer the nitty-gritty to be handled by the officers at another time.

After the business session comes an "enlightening" talk by an uninformed member—or a slightly-askew slide presentation that I fervently wish I had not stayed for. I stayed for one movie, obtained at considerable effort, which proved to be about 15 or 20 years behind the times. Your suggestion for the "Show and Tell" presentation sounds like a real winner. I hope to see more of this.

Another social event is the hamfest. Except for the horrible crush of Dayton, I always end up with good vibes from hamfests.

About 25 years ago, I joined the Quarter Century Wireless Association and went to an outing at Greenfield Village near Detroit. My immediate reaction was claustrophobia. I had been captured in time many years hence. I wasn't ready for this. I am now a life member of QCWA. My wife and I attend occasional dinner meetings in Indianapolis. Another ego trip, but fun.

Speaking of fun, the real fun of amateur radio is building (or buying) and getting on the air with what you have to communicate with others of like persuasion, talking with other hams, making new friends, and keeping in touch with old friends, on SSB, FM, CW, RTTY, ASCII, SSTV, ATV, OSCAR, or whatever comes down the pike. Long live ham radio!

73 from ex-W9IDP, -W8HXA, -W5JYE, -W0QBF, W9MTR, and -W9LNX.

Paul L. Schmidt W9HD
Bloomfield IN

Paul, we all had to cut our teeth on CW. There is nothing to be proud of for that; we had no other choice. If we can stop trying to use CW as a weapon to ward off people who want to be hams and value it as an art, as the real spirit of amateur radio, perhaps we can be proud of it then. Right now I'm ashamed of CW, for it has failed us utterly in keeping out the trash. I'm pro-CW for fun and keeping up the spirit of amateur radio . . . just let's stop turning prospective hams off it by using it as a weapon against them. You're right about business meetings being a drag . . . keep 'em out and let the club/executive committee waste its hours on that bunk.—Wayne.

CLIMB ON!

After reading all the latest about the League, the plain language debate, and other such discouraging issues, it was most refreshing to read the wonderful article by Scott Nelson W7KUF about their Mount McKinley expedition. It is really uplifting to read about the true functions of amateur radio in action. If not anything else, it will drive me to re-up with *73* to keep informed, join one of the many clubs around here, and volunteer for some of the activities for which the hobby used to be noted. Wayne, I know that throughout the years you have always championed the good cause, and sometimes I wonder where you get all the energy for all the work you do. Be assured that many of ham radio's "silent majority" are behind you 100% and your continued rallying will drag us out of the woodwork, like me. Have a great year!

David R. Waters WA6AWZ
San Jose CA

I feel better already.—Wayne.

HOME-BREWING

Let me congratulate you on the "Home-Brew Contest," which is an excellent idea! The current economic woes of this country have made it all but impossible for amateurs like myself, who have a family to support, to upgrade a station with new equipment. Kits and good used equipment also seem out of the question. The home-brew route provides an alternative to this problem. I would be able to purchase the components as I could afford them and learn a lot more about the state-of-the-art of amateur radio as well.

I might add that your idea underscores what I feel is a growing indifference at the ARRL to the basic needs of the amateur. While I will continue to remain a member of this organization, I am not at all happy with the direction they are going. An amateur who can barely afford to get on the low bands or two meters doesn't need articles on how to track the moon, build a QRP rig in a sardine can, or build expensive accessories. Granted, they do publish an article on receiver construction or the like from time to time. And, granted, there are construction projects in the *Handbook*, but I find the construction details sketchy. This, coupled with the cost of the components, tends to scare me off. This leads me to a suggestion.

As you publish home-brew projects, please consider the possibilitiy of providing detailed construction plans. By this, I mean a checklist construction guide similar to the method used by the Heath Company. It would certainly give someone like me, who isn't much beyond the code-oscillator stage, the confidence to tackle something like building a receiver.

Right now your business mind is probably rejecting this idea, figuring the cost in money and man hours that would be required to write step-by-step instructions, create illustrations, templates, etc. I agree that this would not be cheap. However, consider the possibility of publishing the construction details a section at a time over several issues of the magazine. Such a continuing series would certainly encourage newsstand sales and subscriptions. The same artwork for the magazine series could also be adapted to your line of amateur publications.

The bottom line, Mr. Green, is that you have an excellent opportunity to make a lasting contribution to the needs of amateur radio. I would encourage you to weigh the possibilities of this idea as you make your publication plans for this contest.

A Shy WD9

First-rate idea.—Wayne.

FUN, CHEAP, AND . . .

After reading all the "crank" letters in the January, 1982, *73*, I decided to write one of my own. First, I'd like to take issue with people who write in and say that amateur radio is a rich man's hobby. That's a silly statement. Today people pay $500 to $700 for a color TV, $10 to $30 a month for cable charges, $25 for tickets to a bowl game or concert. Amateur radio is cheap entertainment when compared to these other diversions. A state-of-the-art transceiver can be bought for around $500. With a little care, those solid-state beauties will easily last ten years. If an amateur buys one of these rigs, operates twice a week, and brews a pot of coffee each night he operates, at the end of ten years he has spent more on the coffee than the rig. Even then, he could recover a good fraction of his investment by selling the used rig. (For example, check the prices for a used Heath HW-101 compared to the price for a new kit seven or eight years ago. That almost amounts to free entertainment.)

Next, I'd like to console the old-time tinkerers. Tubes are still available. They're cheap. They're functional. If you want to build old-time gear, do it. I've built a few tube CW transmitters and have enjoyed the construction and operation. Please do not yell about others using integrated circuits and transistors. The old-timers were working with state-of-the-art in 1929, and in 1929 tubes were as mysterious as integrated circuits are now (to anyone refusing to learn). This is a hobby, after all. Relax. Read a little, learn a little, and enjoy a lot.

Jim Owens' letter especially bothered me when he said that newcomers in amateur radio must mortgage their homes to buy gear. Jim, take a new guy to a hamfest. Some nice Novice gear (e.g., Heath's HW-16 with vfo, 90 Watts, and full break-in) can be had for less than $100. He doesn't have to sell his home, just carpool for a month and save a few bucks. Jim could even buy such a rig as a spare and loan it to the truly destitute. When the beginner upgrades to a Technician license, he can pick up a rockbound two-meter rig for a similar price. By the time he makes General, he is no longer a newcomer.

Lastly, I'd like to address the people who claim that they are technically oriented and that amateur radio magazines don't publish enough projects. Great! The next time you build a project, take notes, take pictures, write it up, and send it to *73*. Share your ideas with other amateurs, and it will improve the journal you are criticizing.

Amateur radio is fun, cheap, and exciting. If you don't think so, contribute your ideas and improve it. If you can't be bothered to improve or enjoy amateur radio, go to the Y and swim a few laps in the pool. It will be better for your heart and for amateur radio.

Bradley G. Mauger KB5QZ
Greenbelt MD

QSL VIA . . .

I am QSL Manager for the newly-licensed station VQ9JB on Diego Garcia. The operator, Jay Befort, will be there eight months and I will be handling all of his QSLs. Send your cards to 477 Mose Drive, Biloxi MS 39532.

Shari Runyan WD5BHP
Biloxi MS

LEGITIMATE?

This is in reference to the remarks by Tim Daniel N8RK on cable TV radiation (Letters, January issue of *73*). I am most interested, since I have a foot in each camp.

As a CATV engineer, I resent his shotgun statement, ". . . many CATV companies are reluctant to upset the apple cart, much less spend any money that would result in a reduction of short-term profits." How many companies? Which ones? How do you know? What do you know about the CATV company's short-term profit?

He says, "The idea of a legitimate amateur repeater shifting its frequency to accommodate CATV does not appeal to me." I remind him that the CATV operation is also "legitimate." The idea, however, is to work together to find a solution, not to hurl tenuously-founded accusations. What he fails to see (or chooses not to recognize) is an old ham problem from way back: The CATV system can be well within FCC specs, i.e., 20 uV/m at 144.25 MHz, and still be copied by a good grade of ham receiver when the antenna is near the cable. Hams have been fighting this forever—talking into a neighbor's hi-fi, although their transmitters are well within FCC specs. The aim is to work with the neighbor to resolve the difficulty.

His final paragraph ". . . perhaps some high-power transmissions on or about 145.25 MHz will prompt action." makes me cringe. Lynching would also prompt action, but that, too, is unworthy of the ham fraternity. From his letter, I see N8RK as an "I don't like it, so I'll jam it" mentality. As a new ham, I must say he has a vastly different attitude from the many Elmers who have helped me.

Fred Stone KA5MBB
San Angelo TX

Fred, you seem to have read only part of my response. I urged everyone to be "firm but tactful" when trying to solve the problem. A cable system that meets the 20-uV/m rule is not "legitimate" if it violates 76.613b: "The operator of a cable television system that causes interference shall promptly take appropriate measures to eliminate the harmful interference."—N8RK.

SK

After 16 years as the W2 QSL Bureau Manager, I have decided to call it quits. The new bureau's address is North Jersey DX Association, ARRL 2nd District QSL Bureau, PO Box 599, Morris Plains NJ 07950.

Joseph Painter W2BHM is the new manager effective January 1, 1982. The card sorting will be supervised by Ron Levey K2AIO.

The reason for giving up the job? I just celebrated my 81st birthday.

Victor "Digger" Ulrich WA2DIG
Haledon NJ

HAM HELP

I am a Novice who is in search of a working Heathkit RX-1 receiver to complete my station. My income is limited so the price must be very reasonable.

Fred Erickson KA1GGN
105 G. St.
Turners Falls MA 01376

I need help in obtaining a schematic diagram and manual for a Jackson Model CRO-2 oscilloscope, manufactured by Jackson Electrical Instrument Co., Dayton, Ohio. I would be happy to pay for duplication or I will copy and return your original.

Adam J. Patarcity WB3LIQ
47 Bald Cypress La.
Levittown PA 19054

I had a great response to my request for information on the Hallicrafters HT 41, published in the December, 1981, Ham Help. Thank you.

Glenn Churchill KA2IOI
Glens Falls NY

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

Wayne is not overly fond of "April Fool"-type articles. I mention this now because as I get into this month's topic some of you are going to begin to wonder if this is for real.

What would you say to the following situation, which might be observed in my ham shack? I am sitting at the desk, tuning the receiver, looking for stations. The speaker calls out with a male voice, "CQ CQ CQ DE N3BRB." So far not very exciting sounding, is it? But what if I tell you that the station is transmitting on 3620 kHz and is on RTTY? Now I've got you!

What is it that makes this possible? A rather remarkable new device which turns plain text into speech. Unlike speech synthesizers which use prepackaged vocabularies, this unit's abilities are not constrained by such predetermination.

The unit is the Votrax Type 'N Talk (TNT). Based on the Votrax SC-01 chip, this is probably the most capable speech synthesizer on the market. Let's take a look at this rather remarkable device and then consider how the RTTY-voice is possible.

The Type 'N Talk is a small, two-pound box that may be connected to any computer or related device through an RS-232C link. Text to be spoken is sent to it in plain ASCII, using, for the most part, common spelling. The Type 'N Talk contains a text-to-speech translation system that allows pronunciation "by the rules" for normal English speech.

The synthesizer is connected to the host computer (similarly to a modem or serial printer) through an RS-232C interface. A switch located on the rear panel allows selection of baud rates in the 75- to 9600-baud range. The "clear to send" (CTS) and "ready to send" (RTS) lines are used to inhibit transfer of data to the Type 'N Talk when the internal buffer is full. However, users of systems which do not support these functions of the RS-232C interface may alter the feeding software to allow for sufficient delays to provide for buffer emptying. Speech is generated at a rate roughly equivalent to a 110-baud ASCII transmission.

Data sent to the Type 'N Talk is stored in an input buffer of 750 characters. This is roughly one minute of speech. The need for utilization of the CTS-RTS lines becomes obvious when one realizes that at a data transfer rate of 1200 baud, this buffer will be filled in less than seven seconds, or under one second at 9600 baud.

The contents of the input buffer are then submitted to an internal text-to-speech translator which generates the phoneme equivalents of the text input. These phonemes may be recovered from the Type 'N Talk for storage or further processing as ASCII character strings. Normally, the output of the translator is held in a 128-byte output queue, from which it passes to the SC-01 speech chip for processing.

An internal amplifier is provided which is capable of driving an 8-Ohm speaker to an acceptable volume. Of course, the audio may also be recorded, sent over the telephone, or otherwise manipulated.

All of this is remarkable enough, but the Type 'N Talk does not stop there. Software switches are provided, toggled with escape sequences, that allow the Type 'N Talk to provide a variety of functions. For example, data sent to the Type 'N Talk may be processed by the unit, passed down the line to the next RS-232C device in a chain, or both. The ASCII output may be either an echo of the input or a phonetic representation of it. And the Type 'N Talk can be disabled but rendered "transparent," so that it can share an RS-232C line with a printer or other serial device.

Several modes of operation also are provided for. In the normal mode, the character group "MARC," for example, is pronounced as my name. Unfortunately, sending "WA3AJR" results in a strange sound, something like "wah thre hajr." In order to allow pronunciation of letter groups, a CAPS mode is available. Here, groups of capital letters, as a callsign, are spelled out, and lowercase text is pronounced. This allows a great deal of flexibility in handling the type of text we frequently see in RTTY (see, there's one of those groups!).

The diagram in Fig. 1 is an attempt to show many of these functions and switches in a schematic form. It should be obvious that this is not a simple device, but through its complexity it makes operation straightforward.

But how about that RTTY program, I hear you asking? What I did was take a routine that receives Murray code and modify it to output not only to the screen but also to the Type 'N Talk connected to the computer. I have also provided keyboard commands to switch from the CAPS ON mode to the CAPS OFF, so that the CQ is easily identified but the text in a message is pronounced rather than spelled.

Fig. 2 is a flowchart for the program; the full source listing for 6800 computer will be here in RTTY Loop next month.

Turning to the mailbox, we find a note from Don McAllister N7AVJ, in Cedar City UT, who is looking for RTTY programs to run on the new VIC-20 computer. This new entry from Commodore, the folks who brought you the PET, uses the same 6502 CPU that the Apple and KIM use. I suspect, therefore, that some-

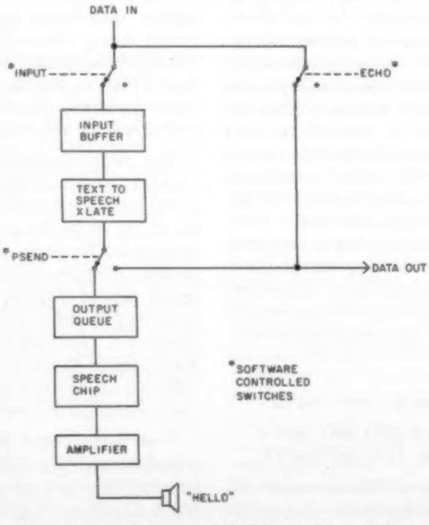


Fig. 1. Block diagram of the Votrax Type 'N Talk.

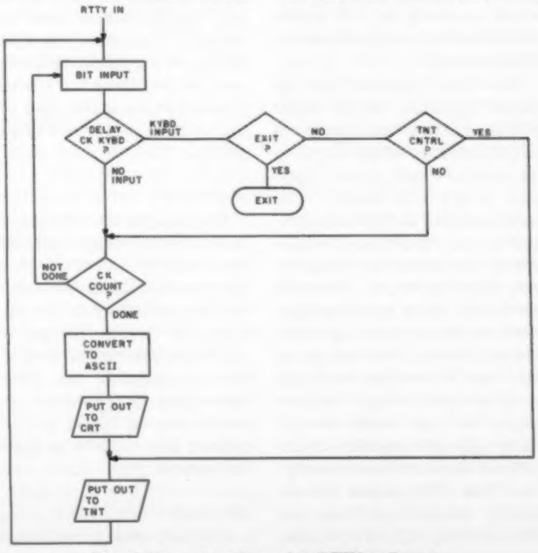


Fig. 2. Flowchart for voice RTTY software.

one handy with 6502 code could adapt one of the many published RTTY programs originally designed for one of those to run on the VIC.

Don also would like to try to put his Sinclair ZX-80 on RTTY. Now, there's a toughy! While this little gem uses a Z-80, my sources tell me that external interfacing may be a bear. I don't have any ready solutions for these problems, Don. If any readers do pass it along, we will share it with all of you.

It's not only the newer systems which keep us on our toes, though. Elston Swanson W3PEE, in Locust Valley NY, has a CP/M-based system—I presume based on an 8080 CPU—that he would like to put on the air on Murray code. Although he has modem drivers for ASCII work, he would like to have a similar Murray routine to allow file transfers and the like.

There have been many RTTY programs published for various 8080- and Z-80-based systems, Elston, and we included a list of the most recent ones in this column a few months back. I suggest you look over some of those programs to see if you could not build a Murray driver into your modem program. That might give you the flexibility you desire without having to reinvent the wheel.

Of course, any readers who are running a CP/M-based Murray system are encouraged to share the information with us all. I never cease to be amazed at the diversity of equipment being used to communicate on this one common mode, RTTY.

We started getting pretty diverse right here this month, what with a voice output for RTTY and all. The program and such will be next month's highlight, along with more surprises, all here in RTTY Loop.

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

CW & RTTY WORLD CHAMPIONSHIPS

CW Event: 0000 to 2400 GMT, April 3
Phone Event: 0000 to 2400 GMT, April 4

Sponsored jointly by *73 Magazine* and the *RTTY Journal*. Use all bands, 10 through 80 meters, on the specified mode. Crossmode contacts do not count. The same station may be worked *once* per mode.

Operator classes are: a) single operator, single transmitter, non-computerized; b) single operator, single transmitter, computerized; c) multi-operator, single transmitter, non-computerized; and d) multi-operator, single transmitter, computerized. Single operator stations may work 18 hours maximum per mode, while multi-operator stations may operate the entire 24-hour period. Off times are no less than 30 minutes each and must be noted in logs. To be eligible for the computerized class, your station must be interfaced with a microprocessor-controlled RTTY and/or CW operating system such as the TRS-80, Heath/Zenith, Apple, PET, OSI, Hal, etc. Utilizing a memory keyer for CW does not constitute a computerized station.

Entry categories are: a) CW only, b) RTTY only, and c) CW and RTTY both.

EXCHANGE:

Stations within the 48 contiguous United States and Canada must send RST and state, province, or territory. All others will send RST and a consecutive contact number. If your station is computerized, add the letter "C" to the end of your exchange.

SCORING:

Count 1 QSO point for each valid contact. An additional *bonus* point is earned if the station worked is computerized and sent a "C" at the end of his exchange. Count 1 multiplier point for each of the 48 contiguous United States and each Canadian province/territory and DX country (outside the contiguous US and Canada). The total claimed score is the total QSO points times the total multiplier points.

AWARDS:

Contest awards will be issued in each entry category and operator class in each of the US call districts and Canadian provinces and territories, as well as in each DX country represented. Other awards may be issued at the discretion of the awards committee. A minimum of 5 hours and 50 QSOs must be worked on a mode to be eligible for awards.

ENTRIES:

Entries must include a *separate* log for each event entered, a dupe sheet, a summary sheet, a multiplier check list, and a list of equipment used for each mode of operation. Contestants are asked to send an SASE to the contest address for official forms!

Omission of the required entry forms, operating in excess of legal power, manipulating scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification.

Entries must be postmarked *no later than* May 10th and sent to: CW and RTTY Championships, c/o The *RTTY Journal*, PO Box RY, Cardiff CA 92007.

CALENDAR

Apr 3-4	**CW & RTTY World Championships**
Apr 10-11	**CARF Phone Commonwealth Contest**
Apr 17-18	**ARCI QRP Spring QSO Party**
Apr 24-25	**YL ISSB QSO Party—Phone**
May 1-2	**County Hunters SSB Contest**
May 15-17	**Michigan QSO Party**
Jun 12-13	**ARRL VHF QSO Party**
Jun 12-13	**Worldwide South America CW Contest**
Jun 26-27	**ARRL Field Day**
Jul 10-11	**IARU Radiosport**
Jul 17-18	**International QRP Contest**
Aug 7-8	**ARRL UHF Contest**
Aug 14-15	**European DX Contest—CW**
Sep 11-12	**ARRL VHF QSO Party**
Sep 11-12	**European DX Contest—Phone**
Oct 16-17	**ARCI QRP CW QSO Party**
Nov 6-7	**ARRL Sweepstakes—CW**
Nov 13-14	**European DX Contest—RTTY**
Nov 20-21	**ARRL Sweepstakes—Phone**
Dec 4-5	**ARRL 160-Meter Contest**
Dec 11-12	**ARRL 10-Meter Contest**

VS6 ACTIVITY DAYS

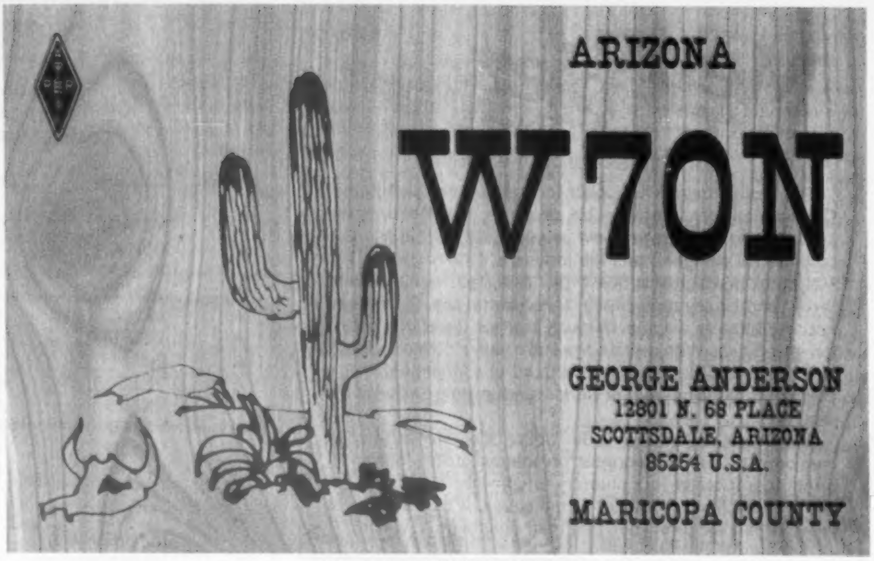
Starts: 0001 GMT April 3
Ends: 1700 GMT April 4

As many VS6s as possible will be active during this time period with the sole purpose of giving as many QSOs as possible to other amateurs worldwide. This activity is not meant to be a contest, but rather a weekend set aside to give DXers and awards chasers a chance at working relatively rare Hong Kong. The Hong Kong Amateur Radio Transmitting Society offers two very attractive awards, with the income from the awards helping to finance the VS6 QSL Bureau.

The *Nine Dragons Award:* One QSO with a country in each of the following 9 zones—18, 19, 24, 25, 26, 27, 28, 29, and 30. The zone 24 QSO must be with a VS6 station. Stations within the 9 zones require 2 QSOs in each zone and 2 VS6s. QSOs after January 1, 1979, are accepted. Award fee is $3 US or 25 IRCs. Certified log extracts should be sent; please do not send QSLs.

Firecracker Award: Six QSOs with different VS6s. QSOs must be after January 1, 1964. Award fee is $2 US or 15 IRCs. Send certified log extracts.

Applications for either award should be addressed to the Hong Kong Amateur Radio Transmitting Society (HARTS), PO Box 541, Hong Kong. As many of their members have QSL managers, you are urged to QSL via the managers and not through the VS6 bureau if at all possible!



QSL OF THE MONTH: W7ON

W7ON believes the best QSL is the simple QSL that instantly communicates a great deal about your station's location. The green saguaro cactus is the symbol of his Arizona QTH; it stands against a desert sand brown wood grain of desert pine. His call letters and address were chosen to be in a brown western font and placed off center to balance the image. The backside is filled out using brown ink to further the desert, dry, barren idea.

If you would like to enter our contest, put your QSL card *in an envelope* and mail it, along with your choice of a book from *73's* Radio Bookshop, to *73 Magazine*, Pine Street, Peterborough NH 03458, Attention: QSL of the Month. Entries which do not use an envelope (the Postal Service does *occasionally* damage cards) and do not specify a book will not be considered.

CARF PHONE COMMONWEALTH CONTEST

Starts: 1200 GMT April 10
Ends: 1200 GMT April 11

All entrants may use the full 24-hour contest period. All radio amateurs licensed to operate within the Commonwealth or British Mandated Territories are eligible to enter. Use SSB only on the 80- through 10-meter bands. Only one contact may be claimed with a specific station on any one band, and duplicate contacts must be clearly marked as such without claim for points. Contacts may be made with any station using a Commonwealth callsign except those within the entrant's own call area. UK stations may not work each other for points.

EXCHANGE:

A contact consists of an exchange and acknowledgement of an RS report and a three-figure serial number starting at 001 and increasing by one for each successive contact throughout the contest period. Do not send a separate series of serial numbers on each band.

FREQUENCIES:

3600, 3780, 7080, 14180, 21200, 28480.

SCORING:

Each completed contact will score 5 points. In addition, a bonus of 20 points may be claimed for the first, second, and third contacts with each Commonwealth call area on each band.

AWARDS:

The CARF Phone Commonwealth Contest Plaque will be awarded to the top scoring entry in the multi-band class. Certificates will be awarded to top scoring entrants in each class in each Commonwealth call area.

ENTRIES:

Separate logs are required for each band. Each band log should be separately totaled and should include a checklist of call areas worked on that band. Logs should include, for each contact: time in GMT, callsign of station worked, exchange sent and received, points claimed. Separate band totals should be added together and total claimed score entered on a summary sheet.

Entries may be multi-band or single-band. Single-band entries should show contacts for one band only. Only single-operator entries will be accepted. Single-operator entries are manned by one operator only who receives no assistance whatever during the contest period. Multi-band entries are not eligible for single-band awards. Each entry will consist of the separate band logs, call area checklists, a summary sheet, and dupe sheets. Entries should be addressed to: CARF Contests & Awards Committee, PO Box 2172, Station D, Ottawa, Ontario, K1P 5W4 Canada. Under no circumstances should entries for the CARF Phone Commonwealth Contest be sent via the RSGB, nor should entries for RSGB's CW Contest be sent via CARF. The closing date for entries will be June 1st. Official summary sheets are available for an SASE.

QRP ARCI SSB QSO PARTY

Starts: 1200 GMT April 17
Ends: 2400 GMT April 18

Participants may operate a maximum of 24 hours during the contest period. Stations may be worked once per band for QSO and multiplier credits.

EXCHANGE:

Members—RS, state/province/country, and QRP number.

Non-members—RST, state/province/country, and power input.

SCORING:

Each member QSO counts 5 points regardless of location. Each non-member US or Canadian contact counts 2 points. Non-members outside W/VE count 4 points. Multipliers are as follows: 8-10 Watts pep output—×2, 6-8 Watts—×4, 4-6 Watts—×6, 2-4 Watts—×8, and less than 2 Watts—×10.

Stations running on more than 10 Watts pep output will count as check logs only. Bonus multiplier is ×2 if 100% natural power (solar, wind, etc.) with no storage or ×1.5 if 100% battery power. Final score is total QSO points times total number of states/provinces/countries per band times the power multiplier times the bonus multiplier (if any).

FREQUENCIES:

1810, 3985, 7285, 14285, 21385, 28885, 50385. All plus or minus to clear interference. VHF/UHF contacts must be direct and not through a repeater.

AWARDS:

Certificates to the highest scoring station in each state, province, or country with two or more entries. Entries are automatically considered for annual Triple Crowns of QRP Award.

LOGS & ENTRIES:

Send large SASE to contest chairman for scoring summary sheet in advance of contest. Separate log sheets are suggested for each band for ease in scoring. Send full log data plus separate work sheet showing details and time(s) off air. No log copies will be returned. All entrants desiring results and scores please include a no.10 envelope with enough US postage for one ounce or an IRC. It is a condition of entry that the decision of the contest chairman of QRP ARCI is final in case

Metroplex

in NJ 201/592-1579

Amateur Communications Association Inc.
Box 237, Leonia, New Jersey 07605

NEWSLETTER CONTEST WINNER

This month's winner is published by the Metroplex Amateur Communications Association, a large repeater-oriented group based in northern New Jersey. Editor WA2OVG is a commercial designer, and his influence clearly shows. The Metroplex newsletter is beautifully designed, with excellent layout and classy typography. A newsletter that looks good not only attracts readers, but also catches the eye of potential advertisers. With over a page and a half of advertising in a six-page issue, Metroplex is able to cover a large percentage of the cost of the newsletter without undue drain on the club's treasury.

The moral of the month is: Utilize the talents of your members. If you have a printer, commercial artist, journalist, or photographer in your club, try to convince him to donate some of his time and talent to the cause. A club's greatest asset is its members—don't let their talents go to waste.

of dispute. Logs must be received by May 20th. Logs received after that date or missing information will be used as check logs. Send logs and scoring information to: QRP ARCI Contest Chairman, William W. Dickerson WA2JOC, 352 Crampton Drive, Monroe MI 48161.

ARBOR DAY CELEBRATION

Starts: 2400 GMT April 23
Ends: 0600 GMT April 26

A special events station will be operating from the Nebraska State Arbor Lodge, former home of J. Sterling Morton, founder of Arbor Day, in Nebraska City, Nebraska, during the annual Arbor Day Celebration. This station, in addition to other club member stations, will be operating in the General portion of the phone and CW bands on 80 through 10 meters. All amateurs contacting this station or any other club member station during this time will be eligible to receive an Arbor Day commemorative certificate from the Nebraska City Amateur Radio Club. Please send one dollar and a business-size self-addressed envelope to: John A. Royal W0GRB, PO Box 146, Nehawka NE 68413.

YL ISSB QSO PARTY—PHONE

Starts: 0001 GMT April 24
Ends: 2359 GMT April 25

Two six-hour rest periods are required. Operating categories include: single operator, DX/WK teams, and YL/OM teams. All bands will be used and the same station may be contacted on different bands for contact points but not as country multipliers. Two meters may be used, but contacts must be direct and not through repeaters.

EXCHANGE:

Name, RS, SSBer number, country, state, and partner's call. If no partner, leave blank. If non-member, send "NO NUMBER."

SCORING:

Score five points for each member contacted on any continent. Non-member contacts count one point. Only member station contacts count for multipliers. Multipliers are each state, country, and province, and also each team contacted, but only once for each team. When DX/WK partners contact each other, it counts as a double multiplier. Final score is sum of QSO points times the total multiplier.

ENTRIES:

Logs must show date/time (GMT), RS, SSBer number, partner's call, mode of operation, band, and period of rest time. Summary sheets show number of states, Canadian provinces, countries, YL/OM teams, DX/WK teams, and partner contacts. Send logs, summary sheets, and completed YL ISSB QSO Party applications to Minnie Connolly KA0ALX, Star Rt. #1, Crocker MO 65452. Anyone needing blank forms or additional information, send an SASE to the above address.

RESULTS

RESULTS OF THE 1981 CARF PHONE COMMONWEALTH CONTEST

Class	Callsign	Score	QSOs	Bonus	Place
A	VE1ASJ	6360	544	182	1
A	G3FXB	5740	448	175	2
A	VE5RA	5730	482	166	3
A	VE3GCO	5180	396	160	4
A	VP2VGR	4130	390	109	5
A	VE5BBD	2915	227	89	6
A	G4APL	2465	129	91	7
A	VE2ZP	2395	139	85	8
A	VK7BC	2245	113	84	9
A	VK6FS	2160	136	79	10
A	VE3UD	1685	117	55	11
A	VE4RP	1375	103	43	12
A	G3ZRL	815	59	26	13
A	VE3KFZ (op. VE3HWS)	605	30	23	14
A	VE3GWM	305	13	12	15
14	VE3KKB	1440	96	48	1
14	GW3MPB	390	18	15	2

How the leaders made their scores: QSOs versus bonus point QSOs broken down by band.

Band	3.5	7	14	21	28 MHz
VE1ASJ	13/12	26/14	83/47	110/41	312/68
G3FXB	4/4	16/12	155/61	140/51	133/47
VE5RA	1/1	30/25	120/52	80/29	251/59
VE3GCO	7/6	15/15	195/67	54/25	125/47
VP2VGR	—	—	115/39	53/28	222/42

COUNTY HUNTERS SSB CONTEST

Contest Periods:

0001 to 0800 GMT May 1
1200 GMT May 1 to 0800 GMT May 2
1200 to 2400 GMT May 2

Please note the two 4-hour rest periods.

Mobiles may be worked each time they change counties or bands. Mobiles that are worked again from the same county on a different band count for point credit only. Mobiles that are contacted on a county line count as one contact but 2 multipliers. Fixed stations may be worked by other fixed stations only once during the contest. Repeat QSOs between fixed stations on other bands are not permitted. Fixed stations may be worked by mobiles each time they change counties or bands. Repeat contacts between mobiles are permitted provided they are on a different band or county. Mixed mode contacts are permitted provided that one station is on SSB. Contacts made on net frequencies will not be allowed for scoring in this year's contest.

EXCHANGE:

Signal report, county, and state or country.

FREQUENCIES:

Suggested frequencies are as follows: 3920-3940, 7220-7240, 14275-14295, 21375-21395, 28625-28650.

There will be a "Mobile Window" of 10 kHz on the following frequencies: 3925-3935, 7225-7235, 14280-14290. Mobiles will be in this 10-kHz segment and fixed stations are asked to refrain from calling "CQ CONTEST" in the mobile window. After working mobiles in the window, fixed stations are requested to QSY outside the window to work fixed stations in the contest. This will allow the mobiles running lower power a chance to be heard and worked in the contest. There will be a special effort to work DX on 28.636 by mobiles.

SCORING:

Contact with a fixed US or Canadian station = 1 point. Contact with a DX station (KL7 and KH6 count as DX) = 5 points. Mobile contacts = 15 points. Multiplier = total US counties + Canadian stations. Score = multiplier × total QSO points.

AWARDS:

MARAC plaques to the highest scoring fixed US or Canadian station, DX station, and 2 top-scoring mobile stations. Certificates to the top 10 fixed and mobile stations in the US and Canada and to the highest scoring station in each DX country.

ENTRIES:

Logs must show date and time, station worked, reports exchanged, county, state, band, claimed QSO points (1, 5, or 15), and each new multiplier must be numbered. Logs and summary sheets are free for a #10 SASE or SAE and appropriate IRCs. Write to: John Ferguson W0QWS, 3820 Stonewall Ct., Independence MO 64055.

All entries must be received by June 15th to be eligible for awards. DX entries should use air mail. Winners will be announced at the 1982 Independent County Hunters Convention during July and in the MARAC *Newsletter*.

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

NOVICES TO NOVICE

Novices, take heart—here is a mini-expedition for you! Beginning April 17th at 1800 Zulu and continuing until 1800 Zulu on the 18th, the North Texas High-Frequency Association will be operating the Novice bands from Novice, Texas. Look for the mini-expedition about the center of the Novice bands, signing the call KC5YN (Young Novice). Operators will work your calling speed (if you're not too fast), so don't worry about calling. A commemorative QSL will be issued to all stations worked who send a legal-sized SASE.

The NTHFA is the same group that brought you "Phone From Telephone, Texas," the "Alternate Olympics" from Moscow, Texas, and the annual mini-expedition from the decks of the Battleship *Texas*, moored in the Houston ship channel.

We look forward to working you, Novice or not, from Novice, Texas; remember to "Keep Calling Five Young Novices."

SOUTH EAST QUEENSLAND TELETYPE GROUP AWARD

This award is open to all transmitting and listening amateurs. Australian amateurs must score 5 points; overseas amateurs must score 3 points.

To qualify, a station must, where possible, copy the official station of the South East Queensland Teletype Group, VK4TTY, during a news broadcast, and, in the case of a transmitting amateur, participate in the call-back (2 points). A portion of the printout of the news broadcast together with the date, time, frequency, and broadcast number are to accompany the request for the award.

Additionally, a transmitting amateur must work three member stations of the SEQTG on RTTY (1 point each). Log extracts and/or printouts are to be included with the award application, and each member station may be counted only once towards the award.

Listening amateurs should, in lieu of (b), forward log extracts and/or printouts of three contacts involving different member stations of the SEQTG (1 point each).

Applicants for the award should forward the above information together with one dollar Australian or 5 IRCs to cover postage and printing costs, to: the Secretary, SEQTG, PO Box 184, Fortitude Valley, QLD 4006, Australia.

MARCCO AWARDS

The Mobile Amateur Radio Club of Colorado (MARCCO) is an organization of licensed amateur radio operators who engage in HF mobile operations. Meetings are held at noon on the first Friday of every month at Wyatt's Cafeteria, Cherry Creek Shopping Center, Denver. Visiting mobilers are invited to attend the monthly meetings whenever they are in Denver.

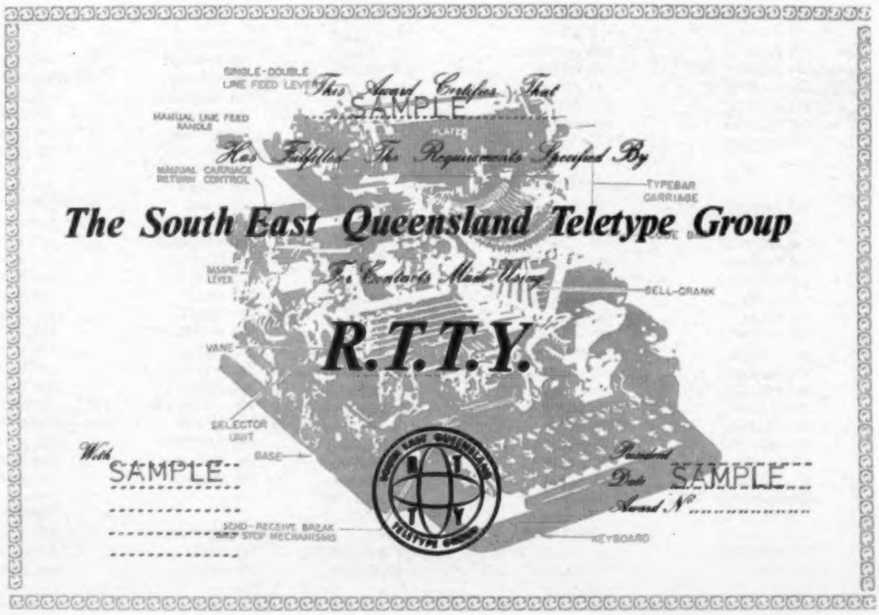
Current MARCCO officers are J.D. Jones WB0BNP, president, Rich High W0HEP, vice president and awards chairman, Paul F. Hultquist WB0SEQ, secretary/treasurer, and John S. Seale, Jr. KD0U, nominating committee chairman.

MARCCO has established several awards effective January 1, 1981. Among them are:

- WACCO Award—Worked mobiles in all Colorado counties.
- Border-to-Border and Coast-to-Coast Awards—Worked mobiles in an unbroken string of counties from Canada to Mexico or from the Atlantic Ocean to the Pacific Ocean. Any string must contain at least three Colorado counties.
- WAMTZ Award—Worked mobiles in all counties in the Mountain Time Zone.

As a gesture of respect and affection for the late Bing Miller W0GV, a charter member of MARCCO, the club will continue the Worked All Bingo award he established for working in all Colorado counties. It will be called the W0GV Memorial Award and will be given for working the same mobile in each of the 63 Colorado counties. Persons who already have worked Bing in one or more Colorado counties, regardless of date, may combine these contacts with those obtained from any other *single* mobile in the remaining counties to qualify for the award.

Log information is sufficient for all MARCCO awards.



This Award Certifies That

SAMPLE..............................

Has Fulfilled The Requirements Specified By

The South East Queensland Teletype Group

For Contacts Made Using

R.T.T.Y.

With
SAMPLE..............
....
....
....

President
Date SAMPLE..............
Award No..............

SINGLE-DOUBLE LINE FEED LEVER
MANUAL LINE FEED HANDLE
PLATEN
MANUAL CARRIAGE RETURN CONTROL
TYPEBAR CARRIAGE
CODE BAR
BELL-CRANK
VANE
SELECTOR UNIT
BASE
SEND-RECEIVE BREAK AND STOP MECHANISMS
KEYBOARD
SOUTH EAST QUEENSLAND TELETYPE GROUP
R T T Y

For more information concerning awards, contact Rich High W0HEP, MARCCO Awards Chairman, 451 East 58th Avenue 239B, Denver CO 80216; telephone (303)-595-9286.

WORKED ITALIAN ISLANDS AWARD

The WIIA, formerly issued by the DX Old Timers Club (DXOTC), was discontinued when the club ceased its activity. The award has now been resumed by ARI. The new award series will start with number 101.

Scope: The award is issued in order to promote activity from islands belonging to Italy and, especially, from minor islands.

Mode: The award will be issued for 2xCW, 2xSSB, and 2xRTTY. No cross modes or mixed modes are allowed. The award is also available for SWL with no mode restrictions.

Bands: Contacts (or heards) can be made on any band between 3.5 and 29.7 MHz, including those allocated by WARC '79 as soon as they are officially allowed in Italy.

Validity: Contacts (or heards) made on January 1, 1982, or after will count for this award.

Contacts: The award will be issued for contacts (or heards) with not fewer than 10 islands or island groups according to the following list: Tuscan Archipelago IA5, Ponziane Islands IB0, Neapolitan Archipelago IC8, Eolie (or Lipari) Islands ID9, Island of Ustica IE9, Egadi Islands IF9, Pelagic Islands (Lampedusa, etc.) IG9, Island of Pantelleria IH9, Cheradi Islands IJ7, Tremiti Islands IL7, Minor Islands surrounding the Island of Sardinia IM0, Sardinia Island IS0, Sicily Island IT9, for a total of 13. A special endorsement will be mentioned in the award if all 13 islands are contacted (or heard).

In order to be credited for the award, contacts (or heards) shall be made with stations permanently located on an island or island group. Credit also will be given for contacts (or heards) made with stations operating temporarily from such locations. These stations shall identify themselves by using their regular call followed by the prefix assigned to that specific island or island group.

Application: Applications shall include all data regarding contacts (or heards) made. Applicant's name and address should be in block letters and should be forwarded with QSLs or other type of written confirmation of the contacts (or heards) made together with 3 US dollars or 10 IRCs to: ARI Award Manager, G. Nucciotti I8KDB, Via Francanzano 31, 80127 Napoli, Italy.

GCR will not be accepted.

PONY EXPRESS DAY

The Missouri Valley Amateur Radio Club will hold its third annual Pony Express Day on April 10, 1982, from 1000 to 1900 CST. The event commemorates the original running of the Pony Ex-

73 MAGAZINE AWARDS PROGRAM

Work the World Award

97 WD6DFN
98 KN4F
99 WA2WRD
100 N8BDI
101 WB9NOV
102 KA3DBN
103 K9GHP
104 W0YBV
105 KA7GIN
106 W8HTM
107 N6ATS
108 KC5TK
109 K3STM
110 9G1RT
111 WA2LYF
112 ZS6ABA
113 VK2HD
114 VE3LVN
115 VE1ACK
116 PY2BTR
117 VE3JPJ
118 HC2RG
119 WA9IVU
120 VK2NHV

North American Award

154 WD6FDN
155 K0UKO
156 W8UMP
157 N8BDI
158 K3WUR
159 WB8PRK
160 WA2WRD
161 KN4F
162 KA3FUU
163 W7HAZ
164 WB4PHW
165 WA9IVU
166 WA9AHZ
167 WB9NOV
168 AK5G
169 KG9O
170 K9GHP
171 WB7WQB
172 WB0CHS
173 KA7GIN
174 W8HTM
175 AL7O
176 DFH-1000742
177 KB2WH
178 VE3MAM
179 WA1UDH
180 KA1UA
181 AG7P
182 WA8KMK
183 K9IML
184 N6ATS
185 WD4JEQ
186 K3STM
187 N3ALL
188 WN8GUE
189 DA1AS
190 OE2-207181
191 KA8JHD
192 WD9IBM
193 N3AKQ
194 9G1RT
195 KL7ISO
196 AK0G
197 OK-DR1239
198 ZS6ABA
199 W8VUZ
200 VK2HD
201 HC2RG
202 KA2MIM
203 VE3JPJ
204 SV1GJ
205 PY3BTR
206 VE1ACK
207 VE3LVN
208 KA5BQM
209 KB8WJ
210 WD0EPV
211 VK2NHV
212 KC3W

South American Award

137 WD6DFN
138 KN4F
139 WA2WRD
140 WB8PRK
141 K3WUR
142 N8BDI
143 WB7WQB
144 K9GHP
145 AK5G
146 WB9NOV
147 WA9IVU
148 W7HAZ
149 KA3FUU
150 W8HTM
151 KA7GIN
152 KG9O
153 WD4JEQ
154 N6ATS
155 K9IML
156 WA8KMK
157 AG7P
158 PY1DWM
159 WA1UDH
160 N3AKQ
161 KA8JHD
162 PY2TTV
163 PY2RHL
164 N3ALL
165 K3STM
166 WD9IBM
167 W8VUZ
168 ZS6ABA
169 AK0G
170 KL71SO
171 9G1RT
172 VE3LVN
173 VE1ACK
174 AL7O
175 KB2WH
176 PY2BTR
177 PY2AJK
178 SV1GJ
179 VE3JPJ
180 KA2MIM
181 HC2RG
182 VK2HD
183 KC3W
184 WD0AVG
185 VK2NHV

Asian Award

109 WD6FDN
110 OE2-207181
111 DFH-1000742
112 KN4F
113 WA2WRD
114 K3WUR
115 N8BDI
116 K9GHP
117 WB9NOV
118 KA3DBN
119 W7HAZ
120 KA3FUU
121 W0YBV
122 W8HTM
123 KA7GIN
124 AI7O
125 N6ATS
126 KC5TK
127 K3STM
128 W8VUZ
129 ZS6ABA
130 VK2KEW
131 OK-DR1239
132 9G1RT
133 WA2LYF
134 VE3LVN
135 VE1ACK
136 WA9IVU
137 PY2BTR
138 VE3JPJ
139 HC2RG
140 VK2HD
141 VK2NHV

African Award

120 WD6FDN
121 N8BDI
122 W1SIX
123 K3WUR
124 WA2WRD
125 KN4F
126 DFH-1000742
127 KA3FUU
128 WA9IVU
129 WB9NOV
130 K9GHP
131 WB3BVL
132 OE2-207181
133 KC5TK
134 KA7GIN
135 W8HTM
136 K9IML
137 W0YBV
138 KA1UA
139 N6ATS
140 WD4JEQ
141 K3STM
142 OE6CTG
143 PY2RHL
144 N3ALL
145 WA8KMK
146 9G1RT
147 OK-DR1239
148 ZS6ABA
149 W8VUZ
150 VK2HD
151 HC2RG
152 8P6OV
153 VE3JPJ
154 PY2BTR
155 KB2WH
156 VE1ACK
157 VE3LVN
158 KC4YY
159 VK2NHV

European Award

176 OE2-207181
177 WD6DFN
178 DFH-1000742
179 KA9ENM
180 W8UMP
181 N8BDI
182 K3WUR
183 WB8PRK
184 WB9KUV
185 WA2WRD
186 KN4F
187 KA3FUU
188 W7HAZ
189 WB9PNW
190 W9NTU
191 W9NTU
192 WA9IVU
193 KA6EBE
194 WB9NOV
195 AK5G
196 K9GHP
197 WB7WQB
198 W9CC
199 KB2WH
200 KL7NX
201 AI7O
202 VE7ADA
203 KG9O
204 KA7GIN
205 W8HTM
206 WA1UDH
207 KA1UA
208 KA2JDP
209 PY1DWM
210 AG7P
211 WA8KMK
212 OZ5EDR
213 WD9INF
214 KH6DRT
215 PY3CJS
216 N6ATS
217 4Z4VG
218 N8CJF
219 WD4JEQ
220 K3STM
221 N3ALL
222 PY2RAN
223 PY2RHL
224 PY2ITO
225 PY2DJC
226 DA1AS
227 KA2JJK
228 DU1CPL
229 PY2TTV
230 KA8JHD
231 WD9IBM
232 9G1RT
233 PY1EWN
234 KL7ISO
235 AK0G
236 OK-DR1239
237 VK2KEW
238 ZS6ABA
239 W8VUZ
240 VK2HD
241 HC2RG
242 KA2MIM
243 PY1BVY
244 VE3JPJ
245 PY2AJK
246 PY2BTR
247 VE1ACK
248 VE3LVN
249 KC3W
250 VK3NHV

Oceanic Award

108 WD6FDN
109 KN4F
110 WA2WRD
111 N8BDI
112 AK1H
113 K9GHP
114 AK5G
115 WB9NOV
116 DF9ZP

press from St. Joseph, Missouri, to Sacramento, California. This year the Club also will help the City of St. Joseph celebrate the 100th anniversary of the death of the outlaw Jesse James. This will be accomplished by offering along with the Pony Express certificate a wanted poster of Jesse James.

Anyone making contact with the Club station, W0NH, is eligible to receive both certificates. The operating frequencies will be 10 kHz from the bottom of the General phone bands on 15, 20, 40, and 75 meters. On 10 meters, the frequency will be 28.575. The CW bands will be 28.150 on 10 meters, 21.150 on 15 meters, and 7.125 on 40 meters.

All that is necessary to receive both certificates is to send two first class postage stamps and a QSL card to the Missouri Valley Amateur Radio Club, 401 N. 12th Street, St. Joseph MO 64501.

ALGOA BRANCH AWARD

This award is available free of charge to amateurs throughout the world.

Amateurs outside zone 38 must make at least ten contacts with Algoa Branch members on at least three different bands. Only one contact per branch member per band will count. A sticker for each extra band will be supplied on application, with proof of contact. All contacts must be made subsequent to the formation of the Algoa Branch on April 14, 1979.

A copy of the log or full details of contacts must accompany the application to: The Awards Manager, Algoa Branch Award, PO Box 10050, Port Elizabeth 6015, Republic of South Africa.

Algoa Branch members are as follows; those with the asterisk are members known to be active on the DX bands.

ZS2AP
ZS2AR
ZS2BE
*ZS2BS
*ZS2C
ZS2CC
*ZS2DJ
*ZS2DK
*ZS2EK
*ZS2HU
ZS2JC
ZS2JE
*ZS2JS
ZS2KU
ZS2LM
ZS2LN
ZS2MD
ZS2MF
*ZS2MG
*ZS2NC
ZS2NH
ZS2OC
ZS2OD
*ZS2RB
ZS2RG
ZS2RH
*ZS2RN
ZS2RR
*ZS2SI
*ZS2SP
*ZS2U
ZS2UI
ZS2W
*ZS2WG

U.S.S. NORTH CAROLINA

The Azalea Coast Amateur Radio Club will be operating from the battleship *U.S.S. North Carolina,* Wilmington NC, on April 17 and 18 from 0830 to 1800 EST. The operating frequencies will be 25 kHz up from the lower edge of the General class phone band.

Please QSL to the Azalea Coast Amateur Radio Club (WD4ORA), PO Box 4044, Wilmington NC 28406, and include an SASE.

ALAMO DXPEDITION

The Border Amateur Radio Society and the Uvalde Radio Club will hold their annual Alamo Village DXpedition on the weekend of April 17-18. W5LFG will be working all bands on

---

117 KA3DBN
118 W7HAZ
119 W8HTM
120 KA7GIN
121 W0YBV
122 K9IML
123 AL7O
124 KC5TK
125 WD4JEQ
126 WA9VU
127 N6ATS
128 KH6JJC
129 KH6DRT
130 AG7P
131 OE2-207181
132 K3STM
133 ZS6ABA
134 VK3KEW
135 KL7ISO
136 9G1RT
137 VE3LVN
138 VE1ACK
139 PY2BTR
140 VE3JPJ
141 WB6SZZ
142 HC2RG
143 VK2HD
144 VK2NHV

DX Country Club Award

2 × SSB

75 WD6FDN
76 8P6OV
77 KN4F ('79)
78 KN4F ('80)
79 WA9IVU
80 W7HAZ
81 K9IML
82 AG7P
83 KA1UA
84 N6ATS
85 KE7C
86 KA3FUU
87 VK2HD ('79)
88 VK2HD ('80)
89 VK2HD ('81)
90 9G1RT
91 SV1GJ
92 WA8KMK
93 VK2NHV
94 CT2CQ
95 HC2RG

2 × CW

1 AA8Z
2 W7ULC
3 SM5AKT
4 WD8MAS
5 WB7PKD
6 W0YBV
7 WB2FFY
8 WB3BVL
9 WB9UIA
10 WB9UIA
11 VE1BWP
12 KA2EAO
13 VE1ACK
14 KC3W

DX Capitals of the World

12 WA2SRM
13 WA2YEX
14 DF7DQ
15 VK6YL
16 OE8MOK
17 8P6OV
18 N6ATS
19 VK2HD
20 ZS6ABA
21 SV1GJ
22 VE1ACK

10-Meter DX Decade Award

1 WB4WRE/M
2 AC3Q
3 W5TJQ
4 WD0AVG
5 DA2AL
6 WB4TZA
7 WD5JRG
8 WA4ZLZ
9 WB8LSV
10 WB9WFZ
11 W8AKS/6
12 KA3FUU

Specialty Communications Award

Class A—Work All States

1 WA6VGS (Via OSCAR 8 Satellite)
2 KE7C (Via RTTY)

Class A1—Over 10 DX Countries

1 W20DA (RTTY)
2 WB0QCD (SSTV)
3 WB7BFK (RTTY)
4 WB0QCD (RTTY)
5 WD9GRI (RTTY)
6 WB6CDM (RTTY)
7 N3AKO (RTTY)
8 DU1EFZ (RTTY)
9 K3WUR (RTTY)
10 WB2VTD (RTTY)
11 PY3CJS (RTTY)
12 KE7C (RTTY)
13 AL7O (RTTY)
14 PY1EWN (RTTY)
15 OE1PBA (RTTY)

Worked All USA Award

Mixed Band

54 N7CPE
55 KA3GSN
56 KA3FUU
57 KA4VNS
58 AG7P
59 N8CJF
60 KA5EEZ
61 KA7JNP
62 WA9IVU
63 8P6OV
64 KA7CPZ
65 AK0G
66 VE3JPJ
67 HC2RG
68 KA0JTT
69 KA2MIM

6 Meters

1 WB0ZKG
2 K6PHE
3 N4BJJ
4 KA5DDE
5 WB5SND
6 K3HFV
7 N4QH
8 N5DDB

10 Meters

1 KL7IEN
2 W5ZKJ
3 VE1BVD
4 JH8DSC
5 VK7NBT
6 VE1BWP
7 N4QH

15 Meters

1 WD5DRB
2 WA0CEL
3 KA6ACO
4 WB6CDM
5 KA4IFF
6 WB9UKS
7 N4QH
8 WB7VBQ

20 Meters

6 WB9UKS
7 VK6YL
8 N8BDI
9 N4QH
10 KA0BOS
3 KA5AOP
4 KS4B
5 WB9UKS
6 KB5FN
7 WA0RVK
8 N4QH
9 W4PCK

160 Meters

1 KC8P

District Endurance Award

5 WA4ZLZ (54 min.)
6 GI4KCE (8.3 min.)
7 WA2MCE (54 min.)
8 XE1TIS (49 min.)
9 K0WNY (52 min.)
10 KE7C (14 min.)
11 KA3FUU (50 min.)
12 SV1GJ (42 min.)

Century Cities Award

Work 100 Cities in 50 US States

23 KC9CA
24 N8CJF
25 KE7C
26 AK0G
27 WB7VBVQ

Q5 Award of Excellence

61 N7CPE
62 N8BDI
63 KA7EII
64 W8UPD
65 KA2IDJ
66 WB9KUV
67 KA5KKZ
68 KA9ENM
69 PY2UGS
70 KA3FUR
71 KA6JQB
72 KA7CPZ
73 KA1DJB
74 KA3GSN
75 WB9HPR
76 W4PCK
77 KA4LSJ
78 KA4LSJ
79 KA3FUU
80 N1BDB
81 KP4FCK
82 KA2MIM
83 W1DWA
84 KA2MMM
85 KA7JNP
86 WA2AKX
87 KP4ERH
88 KA8CUS
89 KA4VNS
90 N8CJF
91 WD0EPV
92 KB8WJ
93 KA0JTT
94 KA5KOS

phone and CW. There will be certificates given to amateurs who work them and send an SASE (8" × 10" mailer). We promise 100% QSL to those meeting these requirements.

Alamo Village, a complete reconstructed western town open to tourists and located a few miles outside of Brackettville, is the movie-making capital of Texas. It was the site of the filming of *The Alamo* with John Wayne and *Bandelero* with Dean Martin, as well as many others. The local amateurs will be working out of such sites as the Cantina, Jailhouse, and even a construction of the Alamo itself.

FIRST BRIDGE OVER THE MISSISSIPPI

The Quad Cities Amateur Radio Club, Rock Island, Illinois, will operate special events stations in commemoration of the first bridge across the Mississippi River, which was a significant development in the opening up of the western United States.

W9YCR will be on the air from 1800 hours UCT (noon CST) Saturday, April 17, through 1800 hours UCT, Sunday, April 18, on the 80- through 10-meter bands on the following frequencies: in the middle of the Novice CW portion of each Novice class band, as low in frequency as possible in the General CW portion of each band and 30 kHz up from the lower edge of the General SSB portion of each band.

QSL via Denny Spurgeon N9BKY, 413 23rd Avenue, Moline IL 61265—and please enclose a business-size SASE for a commemorative certificate.

The Quad Cities is a three-county area surrounding Rock Island and Moline, Illinois, and Davenport and Bettendorf, Iowa. It is the farm implement manufacturing capital of the world, the largest metropolitan area in Iowa and Illinois outside of Chicago, and boasts over 1,000 amateur radio operators.

SUN-DAY

The Indian River Amateur Radio Club (IRARC) will participate in a "Sun-Day" exercise in conjunction with the Florida Solar Energy Center at Cape Canaveral, Florida, on Friday, May 7, and Saturday, May 8, 1982.

The IRARC station will be using the Club call, W4NLX/4, and at that time will be operating completely on solar power.

The hours, frequencies, and mode of operation on both days are as follows:

- 1300 to 1400 GMT, 40 meters, 7,250 to 7,275 kHz, SSB.
- 1400 to 2000 GMT, 15 meters, 21,350 to 21,375 kHz, SSB.

A certificate confirming contact or reception will be issued free to each station or short wave listener who sends a QSL and an SASE (foreign—1 IRC) to: Florida Solar Energy Center, Attention: "Sun-Day," 300 State Route 401, Cape Canaveral FL 32920.

ARMED FORCES DAY

This year's observance of Armed Forces Day marks the 33rd anniversary of communications tests between the amateur radio fraternity and military communications systems. The proceedings will include operations on CW, SSB, RTTY, and SSTV.

Special commemorative QSL cards will be awarded to amateurs achieving a verified two-way radio contact with any of the participating military radio stations. Those who receive and accurately copy the Armed Forces Day CW and/or RTTY message from the Secretary of Defense will receive a special commemorative certificate.

Military-to-amateur cross-band operations will be conducted from 1300 UTC May 15 to 0245 UTC May 16. Military stations will transmit on selected military frequencies and listen for stations on a particular amateur frequency specified by the military operator.

Transcriptions of the CW or RTTY receiving tests should be submitted "as received." Submissions should include time, frequency, and the call letters of the military station copied as well as the receiving station's name, callsign, and address on the submitted copy.

Entries must be postmarked no later than May 22, 1982, and be submitted to the appropriate command: NAM, NPG, or NAV entries go to Armed Forces Day Test, Navy-Marine Corps MARS, 4401 Massachusetts Ave. NW, Washington DC 20390. Send WAR submissions to Armed Forces Day Test, Commander 7th Signal Command, ATTN: CCN-PO-OR, Fort Ritchie MD 21719. Send AIR entries to Armed Forces Day Test, 2045th CG/DONJM, Andrews AFB DC 20331.

SMALLEST QTH?

Neffs Area Amateurs (Belmont County) will operate WB8TQG, the smallest ham radio shack in Neffs, Ohio, and perhaps in the world. Work us and let us know if you have a smaller one!

Times: 1600Z May 29 to 2200Z May 30.

Frequencies: Phone—146.46, 28.610, 21.410, 14.340, 7.265, and 3.965; CW—28.120, 21.120, 7.120, and 3.720.

Certificate for QSL card and business SASE to Floyd WB8TQG, PO Box E, Neffs OH 43940.

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time away from other duties to decipher cryptic notes scrawled illegibly on dog-eared post cards and odd-sized scraps of paper. Please type or print (neatly!), double spaced, your request on an 8½" × 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye," and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

I will pay up to $25 each, including postage, for an original or a copy of an instruction manual and schematic for a Gertsch Model FM-3 frequency meter and an RCA type 710 UHF signal generator.

D. S. Toomb N6AFO
841 W. Tenth St.
Claremont CA 91711

I need service manuals for RCA mobile 450-470 MHz transceiver models CLUE BT2 FH and CMUE BT2 FH. Costs for copying or other costs will be reimbursed promptly.

John S. Hoff KA6HRK
15500-A Williams St.
Tustin CA 92680

I would like to obtain an operating manual and schematic diagram for a National NC300 receiver. I will pay any copying costs.

Tom Race
2104 Claremont Terrace
Utica NY 13501

I am in need of a schematic and instruction manual for a Sorensen ac voltage regulator, Model 1000-S.

Mike Pellock NA6J
4955 School House Rd.
Catheys Valley CA 95306

Does anyone have information about a Teletype oscilloscope (Model OS-11/FGC-5) or a Collins military receiver/transmitter (Model RT-441/TRC-68) for the 225-400-MHz band?

Daniel S. Durgin KA1AFJ/8
121 Lake St.
Uhrichsville OH 44683

I need manuals and schematics for Tektronix Model 532 and 545 oscilloscopes, as well as the associated plug-in amplifiers. I will pay for postage and copying.

Larry Beall WA5TUQ
1333 Edgewood
Lufkin TX 75901

I am looking for six-meter conversion information for a General Electric transmitter-receiver unit MT-16u, issue O, option AT2, serial AL 4129.

Noel P. Larson W0CXR
Star Rt. Box 489A
Merrifield MN 56465

Does anyone have an interest in or experience with using microwave oven magnetrons for service in the 2300-MHz amateur band?

Phil Chadwick W3GMK
Route 2
New Hope PA 18938

CORRECTIONS

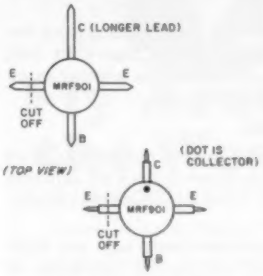


Fig. 1. Pinout diagram for "Amateur Television's Stripper."

"Amateur Television's Stripper" (March, 1982) uses an MRF901 transistor. Several varieties are available, and the accompanying pinout diagram (Fig.1) may be helpful to readers attempting to duplicate this project.

Tim Daniel N8RK
***73 Magazine* Staff**

I made hesitation controls for Ford, Chrysler, and Toyota automobiles. After I sent you my article ("The Hesitator: A Windshield Wiper Control," January, 1982, *73*, page 40), I made one for a friend who owns a General Motors car and ran into a little difficulty. General Motors has a different wiring philosophy for windshield wipers which makes a simpler wiring job to get into it. Instead of the hesitation control unit momentarily connecting 12 volts to the wiper motor as explained in my article, the GM cars momentarily connect the motor to ground to start a park cycle; see Fig. 2.

The wiring at the motor has a three-pin connector. Determine which pin has 12 V when the ignition switch is on. The pin next to it with two leads is the pin needed for the parking cycle start.

The relay contacts in the hesitation control will have to be wired differently; see Fig. 3.

Henry Edwell N4UH
Cleveland NC

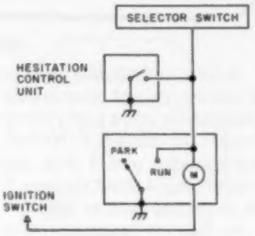


Fig. 2.

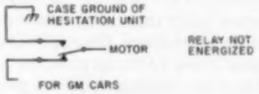


Fig. 3.

HAM HELP

I am looking for information about a R-19 military 100-156-MHz receiver (similar to R-28 but with a different front end), Sperry Gyrocompass repeater Mark XXIV, model 0, Central Electrics model MM-1 multiphase rf analyzer, and model 10 (A or B) single-sideband exciter, military test receiver, type CPR-60 AAB, Bendix Aircraft radio model DA, Millivac Instruments type MV-17C vacuum tube, volt-ohm-milliammeter, and a Servonics Instruments electronic digital voltmeter, model EDR-C. I can make photocopies or will pay a reasonable amount for them.

John White WB6BLV
P1-12 33284
560 N. Indiana St.
Porterville CA 93257

I am in need of a schematic and instruction manual for a Drake R-4B. I will copy and return or pay for a photocopy.

William Bohnenberger
18 E 199 St.
Bronx NY 10468

Does anyone have information on an AM-6154/GRT-21 VHF-UHF amplifier that uses an 8930 in a tuned cavity?

Kent Britain WA5VJB
5809 Stageline
Arlington TX 76017

I need someone to repair my VHF Engineering 2-meter synthesizer. I got it quite a while ago new and factory-wired. VHF Engineering is no longer in business. I've tried several places. The Syn II has never worked with my VHF Engineering 2-meter transceiver, which is OK. I may only be making the wrong connections between the two.

I would appreciate hearing from someone who has used the two together.

Tony W. Stainaker WA4LPJ
2358 Old Al. Rd.
Thomaston GA 30286

I am looking for an instruction manual and schematic for a Navy Model BL-2 transceiver (rec. type CFN-46ABE, trans. type CFN-52ABE) made by Farnsworth Radio and TV Corp. I also need a manual and schematic for a Jackson Model CRO-2 oscilloscope.

Marion Bell KA9BYN
709 West Broadway
Logansport IN 46947

I need any information on the Heathkit SB110A 6m transceiver and/or Heathkit SB500 2m transceiver. Thank you.

Howard Gorden W3CQH
c/o KSI
Suite #2
8403 Dixon Ave.
Silver Spring MD 20910

I am in need of a schematic and manual for an All Star, Jr., all-wave superhet receiver. It is from the early 1930s and uses plug-in coils.

R. F. Bricker K4CSV
PO Box 295
Fort White FL 32038

I am looking for schematics and manuals for a Mercury FC-2 tube tester, Gonset Communicator (FAA version), and a Panoramic Radio Panadaptor model PCA-2T-200.

R. E. Strathkoetter, Sr. WB6SNN
5453 Traymore
Covina CA 91722

I am in need of a schematic for a model BC-1031-C Panoramic adaptor. I would appreciate any information on adapting the BC-1031-C for use with an HW-101.

Gordon Fulp W6FBH
Rt. 3, Box 572A
Placerville CA 95667

I am need of a schematic and tune-up chart for a Hallicrafters SX122.

George Hennessy WB6KJQ
4273½ Fulton Ave.
Sherman Oaks CA 91403

I am trying to get in touch with an old friend. His name is Mike Nicoli WB2XNY/6. I last saw him in El Toro CA where he was attending UC at Irvine. If you have contacted him or know his mailing address, please contact me.

Dennis Duckworth
PO Box 11025
Stanford CA 94305

I am in need of a schematic or any information on a Model 30 printer made by Litton Industries.

Elmer Eddington
1337 West 41st Place
Los Angeles CA 90037

I am in need of a manual or schematic for a Dumont oscilloscope, model 401-A. I will pay for a copy and all associated costs.

Bernard Krull WD2AEU
230 Brinckerhoff Court
Englewood NJ 07631

I would like information that anyone may have on FMing the Heath Seneca.

Larry Campagnano K1PFD
PO Box 171
Guilford CT 06437

I am in need of a three-digit up-down counter circuit that features programmable inputs, reset, a display driver, and digit multiplexer. I am counting pulses from an optical switch used for computer punch-card readers. This is an experimental project so I would like to keep the cost under $5.00.

Larry Starkweather
8231 Camino Del Oro # 3
La Jolla CA 92037

I would like to join a DX association or foundation. Can anyone supply me with addresses and membership information?

Karl M. Leite PS7KM
PO Box 385
59000 Natal
RN, Brasil

OSCAR ORBITS

SYNCART

Quietly, in California and Canada, a group of dedicated amateurs is making steady progress on a plan to place an amateur radio transponder into a geosynchronous orbit above North America. The project is called SYNCART (SYNChronous Amateur Radio Transponder) and it is a collaboration among AMSAT, Project OSCAR, and AMSAT Canada. If all goes well, the transponder could be in orbit as early as 1984.

An object in geosynchronous orbit appears to hang motionless at a point about 23,000 miles above the Earth's equator. Thus, amateurs who use the communications facilities aboard SYNCART could point their antennas toward the proper point in the sky and leave them there. Since SYNCART will not move relative to the surface of the Earth, no complex tracking mechanism will be required. The main disadvantage of a geosynchronous transponder, from the operational point of view, is that it can provide communications to only about one third of the Earth. At least two more such transponders, placed in the correct locations, would be required to provide global coverage. Nevertheless, SYNCART will provide 24-hour-a-day service to most of Region 2.

As with previous amateur space efforts, SYNCART depends upon the scheduled launch of a "professional" satellite for its transportation into orbit. However, unlike other missions in which the amateur payload always separated from the main satellite to assume its own independent orbit, the SYNCART package will remain attached to the main satellite throughout its lifetime. This is a big advantage for the SYNCART planners, since the transponder need not carry its own stabilization and attitude control systems. SYNCART will rely on the main satellite for these crucial necessities.

At present, plans call for SYNCART to carry a 1269-to-435-MHz transponder. A 245-to-435-MHz transponder is also a possibility. There is also an opportunity for linking to the Phase III satellites, since the 435-MHz downlink of SYNCART can be made to fall within the uplink passband of the Phase III birds. Prototype transponders are presently under construction.

It's well to remember that SYNCART is at least two, and more likely three, years away. No flight hardware has yet been built. Still, SYNCART is an exciting prospect and represents another major step forward in amateur space communications.

RS NEWS

Refinements have become available for the robot frequencies given in last month's article about the Soviet Union's RS satellites (*73 Magazine*, March, 1982, page 121). Table 1 contains the latest information.

The Federation of Radiosport of the USSR has set aside Wednesdays (UTC) for experiments on the RS satellites. All amateurs are asked to refrain from transmitting through the satellites on Wednesdays.

RS information is courtesy of the *AMSAT Satellite Report*. For more information on the amateur space program, write to AMSAT, PO Box 27, Washington DC 20044.

BEACON AND ROBOT FREQUENCIES (MHz)

Satellite Name	Beacon Frequency	Robot Uplink	Robot Downlink
RS-3	29.320	–	–
RS-4	29.360	–	–
RS-5	29.450	145.826	29.331
RS-6	29.450	–	–
RS-7	29.500	145.835	29.341
RS-8	29.500	–	–

Table 1.

OSCAR 8 Orbital Information for April

Orbit #	Date	Time (UTC)	Eq. Crossing (Degrees West)
20752	1	0143:02	95.4
20765	2	0004:23	70.8
20779	3	0008:54	72.0
20793	4	0013:25	73.1
20807	5	0017:56	74.3
20821	6	0022:27	75.4
20835	7	0026:58	76.6
20849	8	0031:29	77.8
20863	9	0036:00	78.9
20877	10	0040:31	80.1
20891	11	0045:02	81.2
20905	12	0049:33	82.4
20919	13	0054:04	83.6
20933	14	0058:35	84.7
20947	15	0103:06	85.9
20961	16	0107:37	87.0
20975	17	0112:08	88.2
20989	18	0116:39	89.4
21003	19	0121:10	90.5
21017	20	0125:41	91.7
21031	21	0130:12	92.8
21045	22	0134:44	94.0
21059	23	0139:15	95.2
21072	24	0000:35	70.5
21086	25	0005:06	71.7
21100	26	0009:37	72.8
21114	27	0014:08	74.0
21128	28	0018:39	75.2
21142	29	0023:10	76.3
21156	30	0027:41	77.5

OSCAR 9 Orbital Information for April

Orbit #	Date	Time (UTC)	Eq. Crossing (Degrees West)
2668	1	0005:31	125.0
2684	2	0127:54	145.3
2699	3	0115:07	141.9
2714	4	0102:19	138.5
2729	5	0049:30	135.0
2744	6	0036:40	131.6
2759	7	0023:48	128.1
2774	8	0010:55	124.7
2790	9	0133:09	145.0
2805	10	0120:13	141.5
2820	11	0107:17	138.0
2835	12	0054:18	134.5
2850	13	0041:19	131.0
2865	14	0028:19	127.5
2880	15	0015:17	123.9
2895	16	0002:14	120.4
2911	17	0124:17	140.7
2926	18	0111:11	137.1
2941	19	0058:04	133.6
2956	20	0044:56	130.0
2971	21	0031:47	126.4
2986	22	0018:36	122.9
3001	23	0005:24	119.3
3017	24	0127:18	139.4
3032	25	0114:04	135.8
3047	26	0100:48	132.2
3062	27	0047:31	128.6
3077	28	0034:13	125.0
3092	29	0020:53	121.4
3107	30	0007:32	117.7

OSCAR 8 Orbital Information for May

Orbit #	Date	Time (UTC)	Eq. Crossing (Degrees West)
21170	1	0032:12	78.6
21184	2	0036:43	79.8
21198	3	0041:14	81.0
21212	4	0045:45	82.1
21226	5	0050:16	83.3
21240	6	0054:47	84.4
21254	7	0059:18	85.6
21268	8	0103:50	86.8
21282	9	0108:21	87.9
21296	10	0112:52	89.1
21310	11	0117:23	90.2
21324	12	0121:54	91.4
21338	13	0126:25	92.6
21352	14	0130:56	93.7
21366	15	0135:27	94.9
21380	16	0139:58	96.0
21393	17	0001:18	71.4
21407	18	0005:49	72.6
21421	19	0010:20	73.7
21435	20	0014:51	74.9
21449	21	0019:22	76.0
21463	22	0023:53	77.2
21477	23	0028:24	78.4
21491	24	0032:55	79.5
21505	25	0037:27	80.7
21519	26	0041:58	81.8
21533	27	0046:29	83.0
21547	28	0051:00	84.2
21561	29	0055:31	85.3
21575	30	0100:02	86.5
21589	31	0104:33	87.6

OSCAR 9 Orbital Information for May

Orbit #	Date	Time (UTC)	Eq. Crossing (Degrees West)
3123	1	0129:17	137.9
3138	2	0115:54	134.2
3153	3	0102:29	130.5
3168	4	0049:03	126.9
3183	5	0035:36	123.2
3198	6	0022:08	119.5
3213	7	0008:38	115.8
3229	8	0130:13	135.9
3244	9	0116:41	132.2
3259	10	0103:07	128.5
3274	11	0049:33	124.8
3289	12	0035:57	121.0
3304	13	0022:20	117.3
3319	14	0008:41	113.5
3335	15	0130:07	133.5
3350	16	0116:26	129.8
3365	17	0102:44	126.0
3380	18	0049:00	122.2
3395	19	0035:15	118.5
3410	20	0021:29	114.7
3425	21	0007:42	110.9
3441	22	0128:58	130.8
3456	23	0115:08	127.0
3471	24	0101:17	123.2
3486	25	0047:25	119.4
3501	26	0033:31	115.5
3516	27	0019:36	111.7
3531	28	0005:40	107.8
3547	29	0126:47	127.7
3562	30	0112:48	123.8
3577	31	0058:48	120.0

HAM HELP

I need to know the name of the amateur magazine, with year and month of issue, that had an article describing a means for sorting file cards. There could be one card per article with the appropriate holes punched in the bottom to allow sorting. The author suggested that a commercial version may be available. Any information regarding the article or a source for this kind of file would be appreciated.

Lester R. Lauritzen
Box 117, RFD Route 2
Centerville SD

I am looking for information on the Bendix RTH 27A two-channel FM transceivers used for communication with jet aircraft on the ground. I don't have the command helmets that went with my units. Any information for converting these units to six meters would be welcomed.

Richard Gillespie KC8BQ
107 Ohio Ave.
Charlestown WV 25302

I need a schematic of and service information for a Hy-Gain Model 628G four-channel scanner. I will pay postage and copying costs.

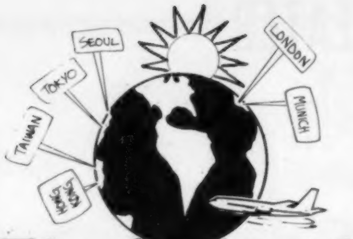
Ray Dunham
477 East 3rd Ave.
Chico CA 95926

I am in need of a schematic and operating manuals for an Eico Model 315 signal generator, TDA-2 telegraph distortion analyzer, and 2M-3/U capacitance analyzer. I will pay copying costs and postage.

H. Hutchison KA0HYH
PSC Box 953
APO MI 34001

I am in need of a Kenwood TR-999 transmitter.

Wayne Hale WA6LCW
839 Mendocino Ave.
Berkeley CA 94707
(415)-525-5702



Fly Around the World!

(and develop a world of business!)

Expand your sales world-wide. Meet importers and manufacturers in Asia and Europe at a series of electronics/computer trade shows arranged for your convenience in Tokyo, Taipei, Hong Kong, Beijing, Canton, Seoul, and Munich. Join about 200 fellow businessmen in taking advantage of this world market for sales and buying. Despite the reasonable tour price it includes some fabulous meals and first class hotels.

Far East Electronics Tour
(Oct. 24–Nov. 7, 1982)

Optional Around-the-World Tour
Including Electronica '82 in Munich
(Nov. 9-13, 1982)

Call Sara collect for more information.
Tel.: (415) 433-3072; (415) 433-3408

Commerce Tours International
870 Market Street, Suite 742
San Francisco, CA 94102

2300 MHz MICROWAVE

COMPARE WITH OTHERS!

SMC-2 DELUXE DOWNCONVERTER KIT $50.00
Includes very detailed instructions, NE64535 high gain RF Amp, thermal drift stab., F connectors, balun, & the original 2300 MHz Antenna Cookbook.

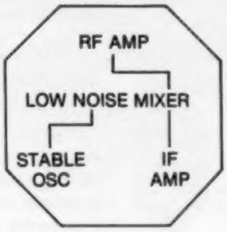
Other Downconverter Kits from $35.00

RFA-1 2-STAGE PREAMP KIT $44.95
Stop sign shape mates with downconverter board. Selective filter. 16 db net gain.

TU-8 DELUXE POWER SUPPLY KIT $44.95
Complete. Quality case and smooth tuning MIL SPEC pot. 8-12 VDC

Other Power Supply Kits from $27.95

ANT-4 ANTENNA KIT $30.00
32 element disk yagi with weatherproof housing. Threaded rod not included.



See you at Dayton!
Beach, Cory & Elaine

WE PAY ALL SHIPPING CHARGES!

SEND SASE FOR OUR COMPLETE LINE OF KITS AND COMPONENTS

SMP

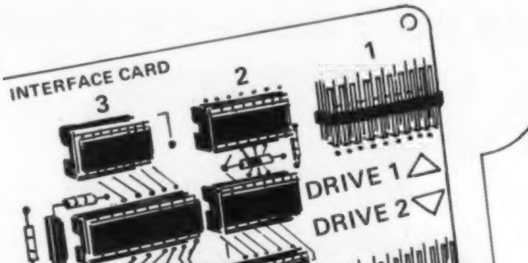
Superior Microwave Products, Inc.
P.O. BOX 1241
VIENNA, VIRGINIA 22180

ORDER TOLL FREE
800-368-3028

IN VA & DC AREA
CALL (703) 255-2918

MasterCard
VISA

376



The Electronic Breadboard

Computer Aided Design (CAD) is one of the newest of the applications of microcomputer technology. THE ELECTRONIC BREADBOARD permits the design and analysis of analog circuits. It can be used to evaluate voltages, currents, impedance and the frequency response of any circuit.

This package is ideal for audio component repairmen, ham radio technicians, hobbyists, electrical engineers, telecommunications engineers, audiophiles and students of electronics. Plug it in and slice away a lot of guesswork.

0287R-47 Model I & III Level II 16K $49.95*

*Plus $2.50 shipping

Instant Software™
PETERBOROUGH, N.H. 03458

445

TO ORDER: See your local Instant Software dealer or call Toll-Free
1-800-258-5473 orders only
In New Hampshire 1-603-924-9471
Mon.-Fri. 8:00 am—4:30 pm E.S.T.

VISA

DRAKE
SURGE SHUNT
MODEL 1549

SURGE SHUNT

protects solid state communications equipment from damage caused by high-voltage transients entering the antenna system

These transients usually are caused by atmospheric static discharges or nearby lightning strikes.

The new **Model 1549 Surge Shunt** can be used with both receivers and transceivers having up to 200 watts output. Convenient UHF type coaxial connections are supplied. Price is **$24.95**

The arrester "pill" element has a long life, but can be easily and economically replaced if necessary.

Credit-Card buyers
may call toll free
1-800-543-5613

DRAKE

In Ohio, or for
information call:
1-513-866-2421

R. L. DRAKE COMPANY
540 Richard Street, Miamisburg, Ohio 45342

INSTITUTIONAL AND DEALER INQUIRIES INVITED.

PORTAPEATER®

$99.00 & up

M100 A
INSTANT REPEATER

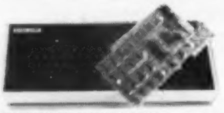
PORTAPEATER

- ★ 4 Channel PROM CW IDer
- ★ Works with any type radios
- ★ VOX or COR operation
- ★ Complete Timer Functions
- ★ 250 volt switching capability
- ★ Built In Test Functions
- ★ An Instant Repeater
- ★ 20 Page Technical Manual

✓ 302

W-S ENGINEERING P.O. BOX 58, PINE HILL, N.J. 08021 (201-852-0269)

STAND ALONE VIDEO BOARD SCT-100



AMATEUR RADIO TELETYPE APPLICATIONS

For RTTY applications, the SCT-100 permits the radio amateur to get "on-the-air" at minimum cost. Its 60 ma. BAUDOT interface connects directly to most FSK terminal units, and when not in use, it may be switched to ASCII mode for use with a home computer. In BAUDOT mode the SCT-100 receives and transmits a 5 bit code compatible with model 15 or similar Teletypes (TM).

COMPUTER TERMINAL APPLICATIONS

The SCT-100 has been configured for direct use with any mini or micro-computer system having a serial ASCII interface. This includes stand alone operation with only an external 12.6 VAC transformer, or direct insertion into any S100 compatible card cage.

SCT-100 VIDEO BOARD ASSEM/TEST	229.00
SCT-100 VIDEO BOARD KIT	189.00
SKT-100 KEYBOARD TERMINAL ASSEM/TEST	449.00
SKT-100 KEYBOARD TERMINAL KIT	389.00

ABM-200
UNIVERSAL CONVERTER
ASCII - BAUDOT - MORSE

APPLICATIONS:
- TTY speed converter
- Interfaces BAUDOT Teletype* to ASCII computer
- Interfaces ASCII terminals to BAUDOT for RTTY
- Converts between TTY and Morse
- Morse Code Trainer

$239.00
ASSEMBLED & TESTED

OTHER XITEK PRODUCTS:
UDT-170 Universal Data
Transceiver

✓ 108

XITEK
P. O. Box 2952
Garland, Texas 75041
214-840-2072

Interested In DX?

Dick Bash says you need **THE COMPLETE IDIOT'S GUIDE TO DX** *(by Stu Gregg, NF4Z) if:*

- ....you think IRC means International Red Cross
- ....you're still working on your DXCC
- ....you think WAC means a female army person
- ....you're not a BIG GUN (yet)
- ....you think the 'BUREAU' is where you put your socks

The Complete Idiot's Guide to DX

The Idiot's Guide pulls no punches and doesn't 'snow' you with nonessentials, but it does unlock some DXers' secrets; for example: How to QSL, What to say, Where to place your antenna, How much power to use, Whose awards can you get, Why and When to use SSB or CW, and much more... things that you need to know, and information that Honor Roll members had to learn the hard way.

Dozens of DXers have been interviewed and their suggestions have been included here. Take a tip from the "Big Guns" and use their secrets and tricks.

THE COMPLETE IDIOT'S GUIDE TO DX is available at dealers nationwide for only $12.95, but if you can't stand to wait, rush Dick $15.45 (which will cover First Class postage). If you live in California, please include 84¢ for Sales Tax. *Telephone orders accepted 10 AM–6 PM California time.*

BASH EDUCATIONAL SERVICES, INC.
P.O. Box 2115
San Leandro, California 94577
(415)352-5420

✓ 26

ALL NEW
15 Meter Mobile CW & USB

21.000—21.450 MHz

High 10W (PEP) low 2W (PEP); VFO tuning; noise blanker; fine-tune SB, KHz ± CW off-set; digital frequency counter; 13.8V dc @ 3A, negative ground; L 9.5" x W 9" x H 2.5"; weight (2.3 kg) 5.7 lbs.; mobile mounting bracket.

SERIOUS DEALER LISTS AVAILABLE

NCG

✓ 318

1275 N. GROVE ST.
ANAHEIM, CALIF. 92806 (714) 630-4541

NOTE: Price, specifications subject to change without notice and obligation.

OVER 70 BRANDS IN STOCK
LAND-MOBILE RADIO
DRAKE · BIRD · HYGAIN · ARRL · ICOM · TEN-TEC · B&W · CDE

AMATEUR RADIO
SHORTWAVE
SCANNERS

Full Service Shop • Spectrum Analysis • Antennas
New and Used Equipment • CW-SSB-FM, Etc. • Towers
FCC Study Guides • Code Tapes • Books • Accessories

SPECTRONICS

Specialists in Amateur Radio, Short-Wave Listening And Contemporary Electronic Gear.

BEARCAT · MORGAIN · MANY MORE.

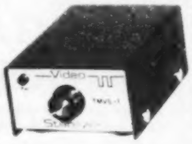
HOURS
MON, TUES, WED.: 9:30-6:00 PM
THURS, FRI.: 9:30-8:00 PM
SAT.: 9:30-3:00 PM

CLOSED SUNDAYS, HOLIDAYS

SPECTRONICS, INC.
1009 GARFIELD ST. OAK PARK, IL. 60304
(312)848-6777

VIDEO STABILIZER KIT

Eliminate picture rolling & jittering caused by copyguarded tapes with our own video stabilizer. Now you can be assured of a true stable picture for quality taping at a price you can afford.



All kits include pre-drilled & etched PC Brd., all components, connectors, hardware, predrilled case, instructional booklet, & 30 day parts warranty.

MODEL TMVS-1 KIT..............**55.00** Assembled 70.00
For use between two VCR's
MODEL TMVS-1RF KIT...........**79.00** Assembled 99.00
(Built in RF Modulator for direct connection from VCR to TV)

OUR GUARANTEE.............If not satisfied, return within 30 days for refund (Less Shipping)

Complete high quality home satellite systems available now from $3895. All systems include heavy duty polar mount. Send $1.00 for information packet & pricing refundable on any order.

TERMS: COD, MONEY ORDERS, BANK CARDS

AMATEUR KITS

2300 MHZ CONVERTER KIT..............................**$35.00**
Includes PC board, parts & instruction manual.

SELECTIVE PREAMP..............................**$44.50**
For use with above converter. This preamp can also be used with other manufacturer's boards for improved performance.

VARIABLE POWER SUPPLY..............................**$24.95**
Includes all components, case, overlays, and built in antenna switch.

DELUXE 2300 MHZ CONVERTER KIT..............................**$99.95**
Recommended for experienced kit builders. Dual stage selective preamp, mixer, i.f. amplifier and no-drift crystal-controlled oscillator.

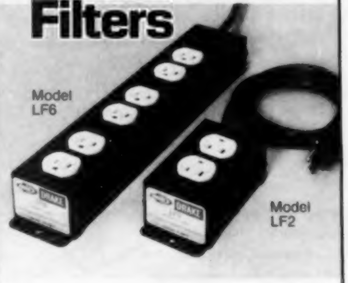
12V STATIONARY POWER SUPPLY..............................**$24.95**
For use with Deluxe Converter.

KD-44 DISH KIT.............25 db Gain...............**$54.95**

KD-22 DISH KIT.............19 db Gain...............**$24.50**

TEXAS MICROTRONICS
P.O. BOX 14116
ARLINGTON, TEXAS 76013
817-860-5440
328

Power Line Filters



These filters protect any sensitive electronic equipment from power line transient damage and radio frequency interference. Both models offer common mode and differential mode surge suppression for power line "spikes". Rf interference is suppressed using both inductive and capacitive components. Ideal for computers, test equipment or TV.

LF2 a duplex outlet, 120V, 8 amps max... **$39.95**
LF6 three separately filtered duplex outlets, 120 V, total fused capacity 15 amps, power switch and indicator lamp........ **$59.95**
Add **$2.50** shipping and handling per order.

Send check with order and provide street address for UPS shipment. Ohio residents add Sales Tax. Charge card buyers may call toll free:
1-800-543-5613

DRAKE
In Ohio, or for information call:
1-513-866-2421

R. L. DRAKE COMPANY
540 Richard Street, Miamisburg, Ohio 45342
INSTITUTIONAL AND DEALER INQUIRIES INVITED.

BARKER & WILLIAMSON'S
PORTABLE ANTENNA
MODEL 370-10

Designed for
APARTMENTS — MOTELS — VACATIONS
Quick Simple Installation. Operates on 2, 6, 10, 15, 20 and 40 meters. All coils supplied. Only 22-1/2 inches long. Weighs less than 2 lbs. Supplied with 10 ft. RG 58 coax and counter poise. Whip extends to 57 inches. Handles up to 300 watts.
VSWR—1.1:1 when tuned
Write for more details and other B&W products
11

B&W
BARKER & WILLIAMSON, INC.
10 CANAL STREET
BRISTOL, PA 19007
215-788-5581
VISA

S-LINE OWNERS
ENHANCE YOUR INVESTMENT

with

TUBESTERS™

Plug-in, solid state tube replacements
- S-line performance—solid state!
- Heat dissipation reduced 60%
- Goodbye hard-to-find tubes
- Unlimited equipment life

TUBESTERS cost less than two tubes, and are guaranteed for so long as you own your S-line.

SKYTEC
Box 535
Talmage, CA 95481

Write or phone for specs and prices.
(707) 462-6882
433

MOVING?

Let us know 8 weeks in advance so that you won't miss a single issue of 73 Magazine. Attach old label where indicated and print new address in space provided. Also include your mailing label whenever you write concerning your subscription. It helps us serve you promptly. Write to:

73 magazine

Subscription Department
P.O. Box 931
Farmingdale NY 11737

☐ Address change only ☐ Payment enclosed
☐ Extend subscription
☐ Enter new subscription ☐ Bill me later
☐ 1 year $19.97 (Canada $27.97, Foreign $44.97/US funds)
Foreign air mail, please inquire.

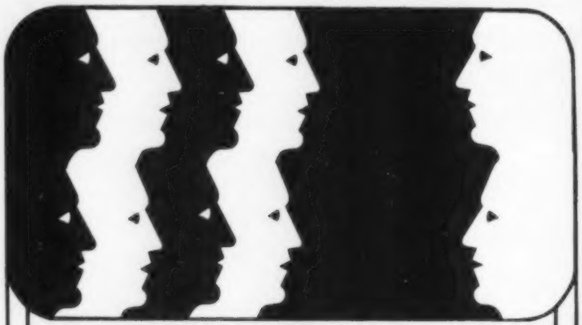
If you have no label handy, print OLD address here.

AFFIX LABEL

Name ______________________ Call __________
Address ______________________________
City ____________ State ________ Zip ________

print NEW address here:

Name ______________________ Call __________
Address ______________________________
City ____________ State ________ Zip ________



Can 20% Be Wrong?

A recent survey showed that 20% of the 73 subscribers also read MICROCOMPUTING magazine . . . and enjoy it. This is the best way to learn and keep up with the rapidly developing world of microcomputers. There's nothing to be afraid of, you just have to read an interesting magazine and you'll learn. Try a subscription to MICROCOMPUTING and see for yourself.

☐ New subscription ☐ Renewal
☐ Payment enclosed $ ____________
☐ VISA ☐ MC ☐ AE ☐ Bill me

☐ 12 issues for $24.97
☐ 24 issues for $37.97
☐ 36 issues for $52.97

Card # ______________________ *Interbank #* __________
Signature ______________________ *Exp. date* __________
Name ______________________________
Address ______________________________
City ____________ *State* ______ *Zip* ________

—for even faster ordering service call toll free (800) 258-5473

Canadian: $27.97, one year only, U.S. funds. Foreign surface, $44.97, one year only, U.S. funds. Foreign air mail, please inquire. Please allow 6 weeks for delivery. 324B6

MICROCOMPUTING • POB 997 • Farmingdale NY 11737

NEW From 73 MAGAZINE

THE 1982 EDITION
GENERAL LICENSE STUDY GUIDE

by Timothy M. Daniel N8RK

This is the complete guide to the General License. Learning rather than memorizing is the secret. This is not a question-and-answer guide that will gather dust when the FCC issues a new test. Instead, this book will be a helpful reference, useful long after a ham upgrades to General. Includes up-to-date FCC rules and an application form.
ORDER yours today and talk to the world.
SG7358 **$6.95**

*Use the order card on the Reader Service page of this magazine or itemize your order on a separate piece of paper and mail to: 73 Radio Bookshop•Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. Add $1.50 handling charge for the first book; $1.00 for each additional book. Questions regarding your order? Please write to Customer Service at the above address. Please allow 4–6 weeks for delivery.

FOR TOLL FREE ORDERING
CALL 1-800-258-5473

TRS 80* OWNERS ARISE!

Arise and subscribe to 80 MICROCOMPUTING, the newest and fastest growing microcomputer magazine. This is full of news about programs, accessories and theory on the world's largest selling computer, the TRS-80*— definitely beginner level and includes lots of program listings. Find out what all the fuss is about.

☐ New subscription ☐ Renewal
☐ Payment enclosed $ ____________
☐ VISA ☐ MC ☐ AE ☐ Bill me

☐ 12 issues for $24.97
☐ 24 issues for $37.97
☐ 36 issues for $52.97

Card # ______________________________
Interbank # ______________ Exp. date __________
Signature ______________________________
Name ______________________________
Address ______________________________
City ____________ State ______ Zip ________

Please allow 6 weeks for delivery
Canadian: 1 yr. only/$27.97 in US Funds
Foreign: 1 yr. only/$44.97 in US Funds

80 microcomputing

• P.O.B. 981 • Farmingdale N.Y. 11737

*TRS-80 is a trademark of Tandy Corporation. 324B6

Radio Bookshop

NEW from 73

THE NEW WEATHER SATELLITE HANDBOOK

BY DR. RALPH E. TAGGART

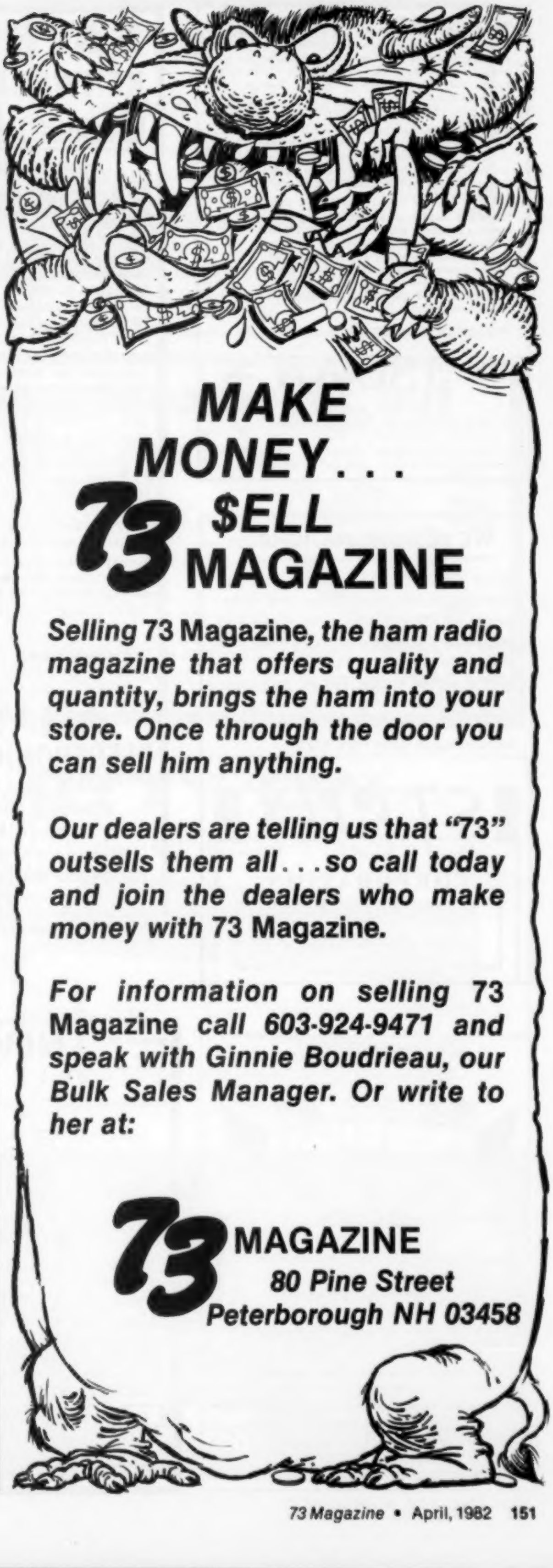
Here is the completely updated and revised edition of the best-selling **Weather Satellite Handbook**—containing all the information on the most sophisticated and effective spacecraft now in orbit. Dr. Taggart has written this book to serve both the experienced amateur satellite enthusiast and the newcomer. The book is an introduction to satellite watching, providing all the information required to construct a complete and highly effective ground station. Not just ideas, but solid hardware designs and all the instructions necessary to operate the equipment are included. For the thousands of experimenters who are operating stations, the book details all procedures necessary to modify their equipment for the new series of spacecraft. Amateur weather satellite activity represents a unique blend of interests encompassing electronics, meteorology and astronautics. Join the privileged few in watching the spectacle of earth as seen from space on your own monitoring equipment. **Order BK7383 $8.95**

SAVE $2.95

WEATHER SATELLITE HANDBOOK (first edition)

By Dr. Ralph E. Taggart WB8DQT. Valuable information in this first edition *is not included* in Dr. Taggart's just published book, **The New Weather Satellite Handbook** (see above). Chapters such as "How to Build an Electric Timer for Satellite Tracking" and "Building an Automatic Control for the Satellite Receiving Station" will no longer be available when this edition is out of print. This is a good entry level text for those discovering the exciting new use of weather satellites. Regular price: $4.95. **SPECIAL PACKAGE PRICE--BOTH BOOKS FOR ONLY $10.95, SAVE $2.95!** (This offer available only while supplies last.) Order WS7300 and receive both editions of the Weather Satellite Handbook for only $10.95 (plus $1.00 shipping and handling charge).

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to: 73 Radio Bookshop • Peterborough NH 03458. Be sure to include check or detailed credit card information. Add $1.50 first book, $1.00 each additional book, $10.00 per book foreign airmail. Note: Prices subject to change on books not published by 73 Magazine. Questions regarding your order? Please write to Customer Service at the above address. Please allow 4-6 weeks for delivery. No C.O.D. orders accepted. For Toll Free ordering call 1-800-258-5473.



MAKE MONEY . . . 73 $ELL MAGAZINE

Selling 73 Magazine, *the ham radio magazine that offers quality and quantity, brings the ham into your store. Once through the door you can sell him anything.*

Our dealers are telling us that "73" outsells them all . . . so call today and join the dealers who make money with 73 Magazine.

For information on selling 73 Magazine *call 603-924-9471 and speak with Ginnie Boudrieau, our Bulk Sales Manager. Or write to her at:*

73 MAGAZINE
80 Pine Street
Peterborough NH 03458

TR-2400 **Automatic Band Scanner**

for Kenwood TR-2400 stops and locks on busy, or stops and resumes when carrier drops. Controlled by keyboard, no switches to add. Installs easily inside rig, six simple connections, no modifications. Does not use space provided for PL.

Assembled—$24.95 Kit—$14.95

TR-9000 **Memory Scanner**

for Kenwood TR-9000 scans 5 memory channels. Stops on busy and resumes when carrier drops. Uses existing controls, No switches to add. Installs easily inside rig. See product review Sept. issue *73 Magazine*.

Assembled—$39.95

IC-280 **Band Scanner—$29.95**

Memory Scanner—$39.95 both for $59.90

- Scanners do not affect normal rig operation.
- Digital readouts display scanned frequency.
- All scanners are easy to install using complete and detailed installation instructions.
- All scanners ASSEMBLED & TESTED (except kit)
- Satisfaction Guaranteed!

Send check or money order to:

ISCAN

26148 W. Mary Ann Rd., Antioch, IL 60002

include $1.50 postage & handling
Illinois res. include 5¼% state tax ✓27

WE'VE GONE NATIONAL

Strux Corporation manufactures and distributes National Radio, Inc. Components: Chokes, inductors, coils, and hardware. We also distribute fixed and roller inductors, contactors, mil-spec and designer knobs. For all your electronic needs, contact Strux Corporation, 100 East Montauk Highway, Lindenhurst, New York 11757.

STRUX ✓30

CORPORATION

100 EAST MONTAUK HIGHWAY
LINDENHURST, NEW YORK 11757

RF MODULATORS

Small Size
3½ x 3 x 1½

Only **49.95**

- CRYSTAL CONTROLLED FOR STABILITY
- IC CIRCUITRY FOR EXCELLENT RELIABILITY
- EXTERNALLY SWITCHED FOR CHANNELS 3 or 4

The VM-1000 RF Modulator is the same type and quality of those found in todays video tape recorders. It has convenient phono jacks for video and audio inputs and has a standard "F" type connector for RF output. Power is supplied by an AC to DC power pack which is included. Call NOW for more information and for quantity discounts.

JJT DISTRIBUTING ✓25
17210 Yukon Ave., Suite #1
Torrance, Calif. 90504
Call COD Orders to: (213) 515-6800

SAVE $100

KENWOOD TR-9000

Closeout Special

KENWOOOD TR-9000

2m All-Mode Transceiver. 10 or 1w output, FM/SSB & CW. Microcomputer frequency selection in 100 Hz, 5 kHz or 10 kHz steps - 144.000 to 147.999 mHz. Digital dual VFOs, five memories, scan with automatic stop scan & free scan. Hand microphone with UP/DOWN freq. control, built-in noise blanker, RF gain, TX offset, RIT, CW sidetone, HI/LO power switch. 13.8vdc @ 2.9A. 6.8"w×2.7"h×9.4"d, 5.5 lbs.

Regular $\$499^{95}$ - ***Closeout*** $\$399^{95}$

TR-9000 Accessories:

PS-20 4½A power supply *(Reg.* $\$77^{95}$*)* **Sale** $\$72^{95}$
BC-1/TK-1 Memory back-up supply............ 20^{00}
BO-9 System base.............................. 42^{95}
SP-120 External speaker .... 41^{00}
MC-46 16 button TTP - UP/DN microphone.... 49^{95}

Quantity Limited. Send Check or Money Order. For prompt shipment - Call TOLL FREE 1-800-558-0411 and use MASTERCARD or VISA; COD orders O.K. Allow $6.00 for UPS shipping charges in the 48 States.

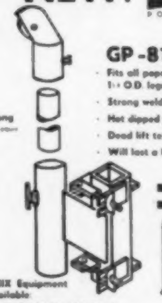
MasterCard VISA

AMATEUR
ELECTRONIC SUPPLY ®
4828 W. Fond du Lac Avenue
Milwaukee, Wisconsin 53216
Phone: (414) 442-4200
Wisconsin WATS: 1-800-242-5195
Nationwide WATS: 1-800-558-0411
AES Branch Stores in: Clearwater, FL • Orlando, FL • Wickliffe, OH • Las Vegas, NV

GINPOLE GP-81
Consists of 3 major parts:

NEW!

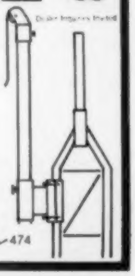
IIX EQUIPMENT
P. O. Box 9 • Oak Lawn, IL 60454
312 423 0605



GP-81 GINPOLE

- Fits all popular towers 1¼ O.D. to 1½ O.D. legs
- Strong welded steel construction
- Hot dipped plated
- Dead lift tested at 120 lbs.
- Will last a lifetime

VISA MasterCard
Dealer Inquiries Invited



Two methods of purchasing the IIX Equipment GINPOLE are available:

Method (1) Purchase GP 81-Kit GINPOLE Includes pulley and clamp assemblies which can easily be shipped U.P.S.

The customer purchases the pipe locally to save shipping cost. Recommended pipe is aluminum 1½" (2" O.D.) electrical mechanical tubing, also referred to as 1½" E.M.T. however, a suitable substitute may be used.

GP 81-Kit $129.50 UPS included

Method (2) Purchase GP 81-1 GINPOLE Assembly Entire GINPOLE shipped Motor Freight F.O.B. Oak Lawn, IL $159.50

✓474

Subscription Problem?

73 Magazine does not keep subscription records on the premises, therefore calling us only adds time and doesn't solve the problem.

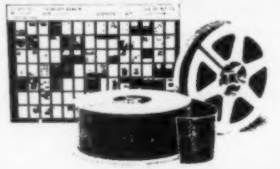
Please send a description of the problem and your most recent address label to:

73 Magazine
Subscription Dept.
PO Box 931
Farmingdale, NY 11737

Thank you and enjoy your subscription.

---

this publication is available in microform



University Microfilms International

300 North Zeeb Road Dept. P.R. Ann Arbor, MI 48106 U.S.A.	18 Bedford Row Dept. P.R. London, WC1R 4EJ England

---

PRESERVE

73 MAGAZINE

BINDERS & FILE CASES

Keep your issues of 73 Magazine together, handy and protected in handsome and durable library files or binders. Both styles bound in red leatherette with the magazine logo stamped in gold.

Files: Each file holds 12 issues, spines visible for easy reference, $5.95 each, 3 for $17.00, 6 for $30.00

Binders: Each binder holds 12 issues and opens flat for easy reading. $7.50 each, 3 for $21.75, 6 for $42.00

(Postage paid in USA. Foreign orders include $2.50 per item)

Please state years: 1977 to 1983

Send check or money order to:
JESSE JONES BOX CORP.
P.O. Box 5120
Philadelphia, PA 19141
Allow 4 to 6 weeks for delivery

Two-meter H.T. Amplifier Kit

$56.95
PPD. USA

1.5 watts in—20 out
COR BNC in—SO-239 out
small size: 1-3/16" × 3" × 4-1/2"
Class C or AB1

ask about
our other
UHF & VHF
amplifier kits

✓459

QRO ENGINEERING
1398 Edwards Ave.
Lakewood, OH 44107
(216) 221-9500

APARTMENT BLUES?
Get on the air NOW!
with
HANDBOOK OF APARTMENT OPERATION
by Dan Fox, W2IQD.
Everything you need to know about operating from these
tough spots. Over 150 fact-filled pages cover
every aspect of apartment/condo operation.
MONEYBACK GUARANTEE
only $8.95 +1.00 p&h Check, MC, VISA (card#-date)
to Wessex Publishing Co. Dept. B9
POB 175 N. Chelmsford, MA.01863

FILTER CASCADING
for
FT101 - TS520 - TS820

Probably the most popular units ever produced, these solidly built transceivers were made to LAST. If you can live without gadgetry, why replace your reliable time-tested rig with a costly new model? Especially since you can easily make your receiver equal in selectivity and ultimate rejection to any now on the market with an **INEXPENSIVE Fox Tango Filter-Cascading Kit?**

CONSIDER THESE FEATURES

- Easy installation - 30 minute average.
- No drilling, switching, alignment.
- 16 pole filtering yields:
  Filter Shape Factor as high as 1.15.
  Ultimate Rejection better than 100dB.
  Works wonders on SSB; improves CW.
- Provides insertion-loss compensation.
- Complete instructions, clear diagrams.
- Improves RX audio; no effect on TX.
- Fits all models of series - any letter.

TS520 Series: Order Kit #520K $70
TS820 Series: Order Kit #820K $70
FT-101 Series (not ZD): Order Kit #4K.... $75

Prices include shipping to US & Canada (elsewhere add $5 for Airmail)

All kits include genuine 8-pole top-quality FT Filter, Improved cascading/mini-amp circuit board, all needed parts, cables, detailed instructions—nothing else to buy.

In addition to the above, **Fox-Tango** features cascading kits for the FT-901/2 ($65), FR-101 ($55), Heathkit SB104A ($60). Also a wide line of SSb, CW, AM, and special filters for Yaesu, Kenwood, Drake R4C and 7-Line, Heathkit, and Collins 75S-3B/C. All **Fox-Tango** crystal filters are guaranteed for ONE YEAR. Beware of cheap imitations; they are no bargain! Go with the BEST—
GO FOX-TANGO

AUTHORIZED EUROPEAN AGENTS
Scandinavia: MICROTEC, Makedein 26,
3200 Sandefjord, NORWAY
Except Scandanavia: INGOIMPEX,
Postfach 24 29, D-8070, Ingolstadt, W. GERMANY.

We welcome mail or phone orders
and accept payment by VISA,
MASTERCHARGE, M.O., Check,
Cash, or C.O.D. (at your expense).

FOX TANGO CORPORATION
Since 1971 By and For Radio Amateurs
Box 15944S W. Palm Beach, FL 33406
Phone 1-305-683-9587
✓323

Take your favorite H.T. out for a drive tonight.

VISA or MASTERCARD for same day shipment.

For $69.95 you get the most efficient, dependable, fully guaranteed 35W 2 meter amp kit for your handy talkie money can buy.
Now you can save your batteries by operating your H.T. on low power and still get out like a mobile rig. The model 335A produces 35 watts out with an input of 3 watts, and 15 watts out with only 1 watt in. Compatible with IC-2AT, TR-2400, Yaesu, Wilson & Tempo! Other 2 meter models are available with outputs of 25W and 75W, in addition to a 100W amplifier kit for 430MHZ.
✓382

Communication Concepts Inc. 2648 N. Aragon Ave., Dayton, OH 45420
(513) 296-1411

RTTY/CW
For the TRS-80*
* A Trademark of the Tandy Corp.

ROM-116
RTTY/CW Operating System
Detailed brochure available on request.

Featuring:

1200 BAUD OPERATION. Not limited to 110 baud because of timing loops. 60, 66, 75 & 100 W.P.M. Plus 110, 150, 300, 600 & 1200 baud operations possible.
FLEXABILITY OF OPERATION. Instantly change: Baud Rates; Program Mode (ASCII/baudot); Program Status.
SPLIT SCREEN VIDEO. Transmit & receive data displayed separately.
REAL TIME. Automatic CW/ID without user intervention. Automatically updates at end of month or year.

Other features include:
- Two Serial Ports
- Fourteen Buffers
- Automatic CW ID
- Transmit Control
- Selective Call Feature
- Error Correction
- Word Wrapping
- Easy To Interface
- 30 Day Unconditional Guarantee
- Hardware requirements TRS-80 Model 1 or 3 16K External terminal unit.

CROWN MicroProducts
606 State Street, P.O. Box 892-R • Marysville, WA 98270 • (206) 659-4279

★★ ★ ★ ★ ★ ★ ★ ★★

ICOM

BP-3 BATTERY IMPROVEMENT

NOW
- TRANSMIT ON DEAD BATTERIES
- MOBILE CHARGE
- HIGHER POWER
- GREATER RANGE

Send your BP-3 with
$20 money order to:

jcs
1100 E. Colonial Dr.
Orlando, FL 32802

Fla. Orders Add 80¢ Sales Tax

★★ ★ ★ ★ ★ ★ ★ ★★

AMPLETTER

(AMṔ LET TER) n. 1. An Amateur Radio publication devoted to the design, construction, and operation of Amateur Amplifiers. 2. A newsletter that can save you money on your next amplifier construction project. 3. A source of parts and information.

The AMP-LETTER is published and mailed First Class every three weeks (17 times/year). It is organized into five departments:

I Editor's Corner
II Letters
III Tech Topics & Tips
IV Feature Article
V AMP-LETTER TRADER

Have parts to sell? Run an ad in the AMP-LETTER TRADER. Subscriber rate is 10¢ per word.

The AMP-LETTER believes that homebrewing an amp can be fun, educational, and half as costly as buying a commercial amp.

A one year subscription to the AMP-LETTER is $18.00/year (17 issues). Mention "73" Magazine and you may subscribe at the special one time rate of $15.00/year.

DON'T MISS A SINGLE ISSUE OF THE AMP-LETTER

AMP-LETTER
RR2 Box 39A
Thompsonville, IL 62890

Place an ad, 10¢/word

Send $2.00 for a sample copy, or $15.00 for a full year of the AMP-LETTER.

✓97

C.B. TO 10 METER KITS
AMERICA'S #1 SOURCE FOR
FM — SSB — AM

IN STOCK—Kits for most C.B. Models
NEW—10-meter FM Discriminator Board—fits most PLL rigs. Kit—Assembled and tested.
NEW AND USED—FM & SSB converted C.B.s now in stock—from $90.
LOW COST—Prices range from $10 to $50.
ORDER BY PHONE—(617) 771-4634
VISA & MASTERCARD—accepted
FREE CATALOG—write or call today!

AMERICAN CRYSTAL SUPPLY COMPANY
P.O. BOX 638
WEST YARMOUTH, MA. 02673
(617) 771-4634

✓7

FINALLY . . . A SQUARE DEAL ON YOUR ELECTRONIC SCRAP

Many "brokers" pay flat rates on scrap, not payment on the value of your material. All material sent to us is individually refined and assayed for maximum return. Take a look at some typical yields:

PC Boards	*50¢ to $7 per lb*
Connectors	*25¢ to $5 per lb*
PC Fingers	*$3 to $20 per lb*
Gold plated pins	*$12 to $50 per lb*

For further information, circle our reader service number or call/write:

er
ELECTRONIC RECYCLERS
OF MASS., INC.
263A S. Main Street, Box 6
Middleton, Mass. 01949
Toll Free (800) 343-8308
In Mass. (617) 777-0455

✓82

Copyright 1982, Electronic Recyclers of Mass. Inc.

You can pay more — But you can't get more!

Model III 16K	**$839**
Model III 48K 2 disc & RS232C	**$2100**
Color Computer 4K	**$310**
w/16K Ext. Basic	**$459**

BUY DIRECT. These are just a few of our great offers which include Printers, Modems, Computers, Peripherals, Disc Drives, Software and more. call TOLL FREE 1-800-343-8124

We have the lowest possible fully warranteed prices and a full complement of Radio Shack Software.

computer plus
Write for your free catalog.
245A Great Road
Littleton, MA 01460
617 • 486 • 3193

✓444

RED HOT SPECIALS!!

AZDEN PCS-3000 2-meter Transceiver	$283.00
AZDEN PSC-300 Handheld Transceiver	288.00
KDK 2025A MK II w/TT mike	265.00
JANEL QSA-5-2-meter Preamp	36.50
BEARCAT 20-20 Scanner	269.00
KANTRONICS FIELD DAY II Codereader	360.00
All MFJ	12% off list price
TEN-TEC Argosy HF Transceiver	465.00
TEN-TEC Delta HF Transceiver	738.00
TEN-TEC Omni C HF Transceiver	1040.00
New SANTEC 144 2-meter Handheld	297.00
New SANTEC 440 Handheld	327.00
AEA MORSEMATIC Keyer	167.00
KANTRONICS MINI CODEREADER SET	249.00
KANTRONICS MICRO-RTTY	255.00

Ben Franklin Electronics
115½ N Main Hillsboro KS 67063
316-947-2269

✓439

YAESU FT-207R OWNERS
AUTO SCAN MODULE AND BATTERY SAVER KIT

WRITE FOR CLUB DISCOUNTS

15 minutes to install; scan restarts when carrier drops off; busy switch controls automatic scan on-off; includes module and instructions.

Model AS-1. $25.00

new
FT-207R BATTERY SAVER KIT
MODEL BS-1 $14.95

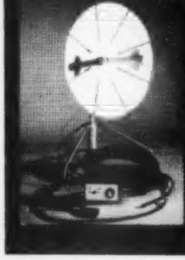
*No more dead batteries due to memory back-up
*30% less power drain when squelched
*Simple to install; step-by-step instructions and parts included
*4 mA memory backup reduced to 500 λA.
*45 mA receiver drain reduced to 30 mA.
*Improved audio fidelity and loudness

ENGINEERING CONSULTING
P.C. Box 3966
ANAHEIM, CALIFORNIA 92803

✓400

QUALITY MICROWAVE SYSTEMS
2100 TO 2600 MHz ANTENNAS MINIMUM 34 db GAIN OR GREATER

Complete System as pictured (6 month warranty)	$149.95
Down Converter (Probe Mntd.) assembled & tested	$59.95
Down Converter (Chassis Mtnd.) assembled & tested	$59.95
Power Supply, assembled & tested	$49.95
Down Converter PC board, with parts, unassembled & Data	$39.95
Data Information (Plans)	$9.95



Send cash, check or money order to:

Phillips-Tech Electronics
Dept. SP-73
P.O. Box 33205
Phoenix, Arizona 85067

✓421

For special quantity pricing, C.O.D.'s, Mastercharge, and VISA call:
(602) 274-2885

C.B. SPECIAL
(Repeat of a sell out)

CONVERT THESE TO 10 METER FM

New Hy-Gain 40 channel printed circuit boards assembly (Squelch pot, volume control and channel switch not included) Boards sold as is. Dimension 6"X6"

1-9 pcs $7.50 ea.
10-49 pcs $6.50 ea.
(While quantities last)

REMOTE 40 CHANNEL C.B.

Remotes have a metal frame. Speaker, plastic case, and control mic not included. Sold as is. **$14.95 ea**

C.B. BARGAIN

C.B. boards missing parts or damaged. Can be used for spare parts. Buy several!!

$3.50 ea

Order information: Please add $4.00 for S/H via UPS. COD's accepted for orders totaling $50.00 or more. Florida residents add 4% sales tax. Minimum order $15.00. Foreign orders US funds only add 20% for S/H. MASTER CARD and VISA accepted.

Surplus Electronics Corp.
7294 NW 54th St.
Miami FL 33166
P.H.# 305-887-8228

✓69

DUPLEXERS

U.S.Patent No.4,080,601

OUR NEW BANDPASS-
REJECT DUPLEXERS WITH EXCLUSIVE

BpBr CIRCUIT FILTERS ®

. . . provides superior performance,
especially at close frequency spacing.

Models available for all commercial and ham bands.
Special prices for amateur repeater clubs.

✓79

WACOM PRODUCTS, INC.

P.O. BOX 7127 • WACO, TEXAS 76710
817/848-4435

BULLET ELECTRONICS

P.O. BOX 401244E GARLAND, TX 75040 214/278-3553 ✓12

7 Watt Audio Amp Kit $6.95

SMALL, SINGLE HYBRID IC AND COMPONENTS FIT ON A 2" x 3" PC BOARD (INCLUDED). RUNS ON 12VDC. GREAT FOR ANY PROJECT THAT NEEDS AN INEXPENSIVE AMP. LESS THAN 3% THD @ 5 WATTS. COMPATIBLE WITH SE-01 SOUND KIT.

Doomsday Alarm Kit $9.95

If you have trouble sleeping and you would like the rest of the neighborhood to share your misery then this little kit will be for you! There is no way to accurately describe the unearthly howls, screams and tones that come out of this kit. Four separate tone oscillators are mixed, cancelled and stepped at a varying rate. 10 Watts of crazy sounds. A great fun kit or a practical burglar alarm. Complete with PC board and all necessary components less speaker. For 6-12 VDC. ORDER DA-02.

New! 3TZ Time Zone Clock Kit

Microprocessor/ROM clock kit keeps local time (12 hour format), and 2 world time zones (24 hour format). Large .6" ORANGE readouts 10 min. ID timer for HAMS. Comes complete with attractive plastic case and wallplug XFMR.

- 6 Digit (hrs., min., sec.)
- 3 Time Zones (Selectable)
- Feathertouch front panel switches
- Seconds Reset Hold feature
- Quartz XTAL Timebase
- Battery backup
- Quality solder masked and plated PC boards

$54.40

Overvoltage Protection Kit $6.95

Protect your expensive equipment from overvoltage conditions. Every computer should have one! **Works with any fused DC power source** from 10 to 20 volts up to 25 amps.

Sound Effects Kit $18.50

The **SE-01 Sound Effects Kits has** all you need to build a programmable sound effects machine except a battery and speaker. Only the SE-01 provides you with additional circuitry that includes a **Pulse Generator, Mux Oscillator and Comparator** to make more complex sounds a snap. **Includes TI76477**, (w/specs) assembly instructions and programming examples. You can easily create **Gunshots, Explosions, Steam Trains, Wind & Surf** and much more.

Complete Kit With quality PC Board (Less battery & spkr.) **76477 Chip is included**	$18.50
Extra chips	$3.15 ea.

ELECTRONIC MUSIC MAKER

THIS UNIQUE KIT CONTAINS A *MICROPROCESSOR CHIP WITH ROM*. IT HAS BEEN PROGRAMMED TO PLAY THE FIRST *6 TO 10 NOTES* OF THE TUNES LISTED BELOW. *CONSTRUCTION IS SIMPLE*, WORKS WITH ANY 8 OR 16 OHM SPKR.(*NOT INCLUDED*). THE KIT WILL OPERATE ON 12VDC OR 12VAC WITH OPTIONAL *TRANSFORMER*, (CONVERTS TO 117VAC). *ALL COMPONENTS & BOARD*

Complete Kit $16.95 Transformer $1.35

Tunes: Toreador * William Tell * Hallelujah Chorus * Star Spangled Banner * Yankee Doodle * America, America * Deutschland Lied * Wedding March * Beethoven's 5th and 9th * Hell's Bells * La Vien En Rose * Star Wars Theme * Clementine * Augustine * Jingle Bells * God Save The Queen * Colonel Bogey * Marseillaise * O Sole Mio * Santa Lucia * The End * Blue Danube * Brahms Lullaby * Westminster Chime * Simple Chime * Descending Octave Chime

Regulator Card Kit $14.95

This is the Regulator Card from our famous **20A Power Supply Kit.** Although we ran out of the transformers and heatsinks, many customers have been able to locate their own. The regulator card performs the actual voltage regulation and has adjustable fold back current limiting. Output voltage **is stable to 200MV from 0 to 20 Amps and adjustable from 11 to 14 Volts.** Designed to drive 2 high current NPN transistors (2N3771, 2N5301 or equiv.) The unit assembles quickly. Included are all the on board components including a driver transistor and over-temp shutdown sensor. Designed to screw down to a standard 3" diameter computer grade filter cap. The quality plated PC card is 3-1/2" x 4 3/4".

WITH INSTRUCTIONS

REGULATOR CARD KIT	**$14.95**
HIGH CURRENT PARTS (2 - 2N3772 & 25A Bridge)	**$5.00**
51,000 MFD @ 40V Computer Grade	**$3.50**

Requires Transformer with 16 - 19 VAC Out @ The Current You Expect To Draw.

THE SUPER MUSIC MAKER KIT REVISION 2 – $24.95

Now you can play hundreds of songs using the Bullet **Super Music Maker**. The unit **features a single factory programmed microprocessor IC** that comes with 20 pre-programmed short tunes. By adding the additional **PROMS** (2708's) the system can be expanded to play up to **1000 notes per PROM**. The kit comes with **all electronic components (less the PROM)**, and a drilled, plated and screened PC Board which measures 4" x 4½". The **7 watt amplifier** section is on the same PC board and drives an 8 ohm speaker (not included). Since the unit works on **12 VDC** or **12 VAC**, vehicle or portable operation is possible. **What do you get for $24.95? Everything but a speaker, transformer, case, switches, and PROM.** Additional 2708 PROM's album containing popular tunes are avilable for **$9.95** each. Lists of available **PROM** albums are available on request.

DIP Switches One 8 pos., One 5 pos. (Can be **directly soldered** to PC Bd. to access tunes)	**2.00/Set**
Rotary Switches Two 5 position (For **remote wiring** to PC Bd. to access tunes)	**2.50/Set**
Attractive Tan Plastic Case	**6.50**
Wallplug Transformer (For operation on 117VAC house voltage)	**3.00**

INVENTORY CLEARANCE

CA3080 TRANS COND AMP	.88
TLO-82 DUAL BI-FET AMP	.88
CD4566 CMOS ÷ 50/60 CNTR	.88
MC3301 QUAD OP AMP (HSE #)	.44
FPT500 PHOTO TRANSISTOR	.44
TIP 110 NPN DARL. 2A IC	.88
TEMP CONTROLLED HOTPLATE 5"x10" TEMPERED GLASS 110°F to 160°F	1.88
3850 (F8) MICRO P CHIP	2.88
10103 SENSITIVE GATE SCR	3/.88

Start the new year right...the saving way!

DUAL PHOTO RESISTOR 3/8" DIA	3/.44
AY 3-8910 SOUND EFFECTS	11.88
60 PAGE MANUAL FOR ABOVE	2.88
JUMBO RED LED ASST. STYLES	20/1.88

SUPER SPECIAL DEAL!

STANDARD C-60 CASSETTE NEW IN PLASTIC CASES. TOP QUALITY ORIG. USED IN DIGITAL APP. FREQ. RESPONSE 300HZ - 10KHZ

1.30 ea. 3/3.50

ORDERING INFORMATION:

Call or Write For Free Catalog

- COD MINIMUM $20.00 • ADD $2.50 FOR COD'S
- UPS DELIVERY ADDRESS MUST ACCOMPANY ALL COD ORDERS
- $1.00 HANDLING ON ORDERS UNDER $10.00
- VISA, MC CARDS OR CHECK
- ADD 6% FOR SHIPPING
- TEXAS RESIDENTS ADD 5% STATE SALES TAX
- ALL FOREIGN ORDERS ADD 25% FOR SHIPPING (CANADA 15%) NO FOREIGN COD'S
- CALL (214) 278-3553 TO PLACE CREDIT CARD OR COD ORDER

✓112

SINTEC COMPANY

Drawer Q, Milford, N.J. 08848

"Quality Electronic Parts by Mail"

Free Sintec Catalog - Over 1000 Items
$10.00 Min. Order - N.J. residents add 5% sales tax.
Postage: Add 5% plus $1.00 Insurance.
Sintec accepts: Check, Money Order,
Visa, Master Charge, C.O.D.
Phone Orders Welcome
Toll Free Call 1-800-526-5960
N.J. Residents (201) 996-4093

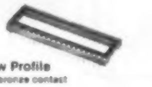
ELECTRO SPACE PRINTED CIRCUIT CARD EJECTORS

For 1/16 thich cards (.072 slot)

Stock No.	Color	1-24	24-49	50-Up
11450	White	$.25	$.21	$.19
11451	Red	.25	.21	.19

ELECTRO SPACE PRINTED CIRCUIT CARD INJECTOR/EJECTORS FOR 1/16 THICK CARDS

11452	White	$.27	$.23	$.20
11453	Red	.27	.23	.20



Pin Straightening Tool puts devices on their true row to row spacing. One side is for .300 center devices, flip tool over for devices on .600 centers. Put device in tool, squeeze, bowed leads come back to proper spacing.

Before
After

Stock No. 11089 .... $12.95

HEX-WIK SUPERIOR SOLDER REMOVAL BRAID

Stock No.	Braid Size	Ft/Spool	Price
50041	1/16	6	$2.10
50042	5/64	6	2.25

ARIES ZERO INSERTION FORCE SOCKETS

- Cam actuated, true zero insertion force
- tin plated solder tail pins
- capable of being plugged into DIP sockets

Stock No.	No Pins	1-24	25-49	50-Up
11055	24	$4.06	$3.60	$3.25
11056	28	4.25	3.77	3.40
11057	40	4.90	4.34	3.91
11058	64	9.80	8.76	7.90

Texas Instruments Low Profile Sockets

tin plated phospher bronze contact pins with gas-tight seal.

Stock No.	No. Pins	1-24	25-99	100-Up
11201	8	$.15	$.13	$.12
11202	14	.18	.15	.14
11203	16	.21	.18	.16
11204	18	.24	.21	.19
11205	20	.27	.24	.21
11206	22	.30	.26	.23
11207	24	.33	.30	.25
11208	28	.39	.34	.29
11209	40	.53	.45	.40

ELPAC POWER SUPPLIES SOLV SERIES FULLY REGULATED

Stock No.	Output Voltage	Output Current Rating	Dimensions (HxWxD) In Inches	Price
13802	5	3.0A	4-7/16x4x2	$38.00
13803	12	1.5A	4-7/16x4x2	38.00
13804	15	1.2A	4-7/16x4x2	38.00
13806	24	0.75A	4-7/16x4x2	38.00
13808	5	6.0A	5-5/8x4-7/8x3-3/16	57.00
13809	12	4.0A	5-5/8x4-7/8x3-3/16	57.00
13810	15	3.3A	5-5/8x4-7/8x3-3/16	57.00
13812	24	2.0A	5-5/8x4-7/8x3-3/16	57.00

RCA C/MOS

Stock No.	RCA No.	1-24	25-Up
44001	CD4001BE	$ .36	$ .33
44002	CD4001UBE	.36	.33
44007	CD4007UBE	.36	.33
44011	CD4011BE	.36	.33
44012	CD4011UBE	.36	.33
44013	CD4013BE	.56	.52
44015	CD4015BE	1.07	1.01
44016	CD4016BE	.59	.55
44017	CD4017BE	1.07	1.01
44019	CD4019BE	.59	.55
44020	CD4020BE	1.18	1.12
44023	CD4023BE	.36	.33
44024	CD4024BE	.92	.87
44025	CD4025BE	.36	.33
44027	CD4027BE	.68	.64
44030	CD4030BE	.59	.55
44040	CD4040BE	1.18	1.12
44046	CD4046BE	1.56	1.48
44049	CD4049BE	.57	.54
44050	CD4050BE	.57	.54
44051	CD4051BE	1.18	1.12
44052	CD4052BE	1.18	1.12
44053	CD4053BE	1.18	1.12
44054	CD4054BE	1.96	1.86
44056	CD4056BE	1.96	1.86
44060	CD4060BE	1.48	1.40
44066	CD4066BE	.78	.74
44069	CD4069UBE	.36	.33
44070	CD4070BE	.44	.41
44071	CD4071BE	.36	.33
44076	CD4076BE	1.26	1.20
44081	CD4081BE	.36	.33
44093	CD4093BE	.78	.74
44098	CD4098BE	1.56	1.48
44502	CD4502BE	1.72	1.64
44511	CD4511BE	1.26	1.20
44522	CD4520BE	1.18	1.12
44590	CD22100E	2.49	2.35
44591	CD40103BE	1.96	1.86
44592	CD40106BE	.84	.80

RCA POWER

SINTEC	RCA No.	1-24	25-49
40122	C122D	$1.22	$1.16
42322	T2322D	1.46	1.38
42700	T2700D	2.07	1.96
42800-1	T2800B	1.58	1.50
42800-2	T2800D	1.90	1.79
42850	T2850D	2.06	1.95
40029-1	TIP29	.60	.57
40029-2	TIP29A	.64	.61
40031	TIP31A	.74	.70
40121	TIP121	1.43	1.35
40125	TIP125	1.37	1.29
42955	MJ2955	1.16	1.10
43065	RCA3055	1.03	.97
42102	2N2102	1.28	1.22
42270	2N2270	.82	.78
43053	2N3053	.61	.58
43054	2N3054	1.37	1.29
43055-1	2N3055	1.03	.97
43055-2	2N3055HOM	1.62	1.54
43439	2N3439	1.73	1.65
43440	2N3440	1.25	1.19
43771	2N3771	2.92	2.78
43772	2N3772	3.16	3.00
43773	2N3773	3.22	3.04
44036	2N4036	1.08	1.02

SINTEC	RCA No.	1-24	25-49
44037	2N4037	$ .86	$ .82
45294	2N5294	.80	.76
45296	2N5296	.80	.76
45320	2N5320	1.25	1.19
45321	2N5321	1.02	.96
45322	2N5322	1.61	1.53
45415	2N5415	1.60	1.52
45416	2N5416	2.17	2.06
45784	2N5784	1.37	1.29
46044	2N6044	2.04	1.93
46101	2N6101	1.25	1.19
46103	2N6103	1.25	1.19
46107	2N6107	.82	.73
46109	2N6109	.82	.78
46111	2N6111	.80	.76
46254	2N6254	2.16	2.05
46290	2N6290	.80	.76
46292	2N6292	.80	.76
46386	2N6386	1.05	.99
46387	2N6387	1.15	1.09
46388	2N6388	1.28	1.22
46474	2N6474	1.03	.97
46667	2N6667	1.48	1.44
46668	2N6668	1.60	1.32
40347	40347	1.22	1.16

TI STATIC RAMS, EPROMS, AND DYNAMIC RAMS

Stock No.	TI No.	Description	1-24	25-Up
47625	TMS2708-45JL	1KX8 EPROM 450 NS	$ 9.50	$ 8.75
47630	TMS2516-45JL	2KX8 EPROM 450 NS	15.45	14.25
47635	TMS2532-45JL	4KX8 EPROM 450 NS	23.80	22.00
47640	TMS2114-45NL	1KX4 SRAM 450 NS	9.50	8.75
47645	TMS40L44-45NL	4KX1 SRAM 450 NS	11.90	11.00
47650	TMS4116-20NL	16K DRAM 200NS	6.60	6.10

IC Insertion/Extraction Kit, includes DIP IC extractors and inserters to accomodate all IC's from 14 to 40 pins. C/MOS safe.
Stock No. 13309 .... $34.95

ELPAC POWER SUPPLIES DC/DC CONVERTERS

Stock No.	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (MA)	Dimensions (HxWxD) In Inches	Price
300 MW Type					
13825	3.0-7.0	12±0.6	0-25	.48x.51x3.06	$7.00
13826	3.0-7.0	12±0.6	0-25	.48x.51x3.05	7.00
13827	3.0-7.0	15±0.7	0-20	.48x.51x3.05	7.00
13828	3.0-7.0	15±0.7	0-20	.48x.51x3.05	7.00
13829	3.0-7.0	28±0.7	0-10	.48x.51x3.05	7.00
13830	3.0-7.0	28±0.7	0-10	.48x.51x3.06	7.00
1.5 W TYPE					
13831	4.0-7.0	12±0.6	125	.651x1.2x1.77	23.00
13832	4.0-7.0	12±0.6	125	.651x1.2x1.77	23.00
13833	4.0-7.0	15±0.7	100	.651x1.2x1.77	23.00
13834	4.0-7.0	15±0.7	100	.651x1.2x1.77	23.00
13835	4.0-7.0	28±1.4	50	.651x1.2x1.77	23.00
13836	4.0-7.0	28±1.4	50	.651x1.2x1.77	23.00

"Floppy Disc" power supply for 8" drive, as built by Shugart, CDC, Wango, etc., three outputs (+5V, +24V, -5V). Output current max (2.5A, 3.0A/3.4A PK, 0.5A). Stock No. 13801 .... $109.00

MODUTEC

- VOLT/OHM Milliammeter (Stock No. 13725) $34.75
- Battery Tester for small batteries from 1.35V to 4.5V (Stock No. 13733) $13.95
- Miniclamp AC Volt-Ammeter

Stock No.	AC Amperes Ranges	Price
13730	0-25A	$39.50
13731	0-50A	39.50
13732	0-100A	39.50

- LINE SPLITTER allows fast & accurate readings of AC power consumption (Stock #13727) .... $ 9.95
- VOM-MULTITESTER Versatile Volt-Ohm Milliammeter (Stock #13729) $13.95

Bow Rosin Core Solder (60/40 Alloy)

Stock No.	Dia.	Length (feet)	Weight (Oz)	Price
50075	.062	9	1.5	$3.39
50076	.062	25	4	4.39
50077	.062	50	8	6.02
50078	.032	33	1.5	4.06
50079	.032	88	4	5.19
50080	.032	175	8	8.82

QUADS TOWERS. TOWERS QUADS

2, 3, 4 ELEMENT QUADS AND ALSO THE "Special" 40. **pretuned,** with bamboo or fiberglass spreaders. **Our references are any amateur who owns a Skylane.** Priced at $121.00 and up. WARC frequencies easily added. Enclose 50¢ **for details and treatise on quads.**

TOWERS.

Steel or Aluminum. Crank down and tilt over, from $360, less liberal discount. Dollar bill for complete information on both towers/quads.

SKYLANE PRODUCTS
W4YM
406 Bon Aire Ave.,
Temple Terrace, Fla. 33617
Phone 1-813-988-4213

CB TO TEN METER CONVERSION KITS

KITS for AM—SSB—FM 40 Channel PLL chassis conversions

DETAILED INSTRUCTIONS for easy installation with minimum time and equipment

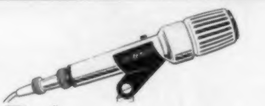
BAND COVERAGE flexibility provides up to 1 MHz coverage for most PLL chassis.

PRICES Low cost prices range from $8.00 to $50.00

All kits are in stock including several different FM kits.

FREE CATALOG Write or call today.

✓78 **INDEPENDENT**
CRYSTAL SUPPLY COMPANY
P.O. Box 183
Sandwich, Ma. 02563-0183
(617) 888-4302



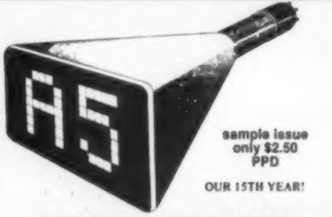
16-Pole Equalizing RF Processor

New Sherwood SE-2 mike-line speech processor for any transmitter or transceiver. An outgrowth of the Sherwood no-compromise RF/IF processors. Contains built-in SE-1 mike frequency-response equalizer for maximum intelligibility. Easy to install. No transmitter modifications required. Two specially designed 8-pole crystal filters, plus hard, active IC clipping assure excellent talkpower and high processing efficiency. Wide dynamic-range IC balanced modulator and product detector. Audio input/equalizer circuitry works with both high- and low- impedance microphones without overload or distortion. Adjustible clipping 0 to 30 dB or more. Equalization 0 to 20 dB. Versatility, quality, performance; for the amateur who demands the best. Model SE-2: $400.00.

Add $3 shipping per order; $15 overseas air.

Europeans: Please contact Ingoimpex, Postfach 24 49, D-8070, Ingolstadt, West Germany.

Sherwood Engineering Inc.
1268 South Ogden St.
Denver, Colo. 80210
(303) 722-2257



sample issue only $2.50 PPD

OUR 15TH YEAR!

AMATEUR TELEVISION MAGAZINE

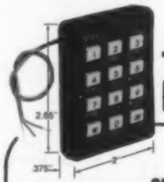
✓115

"FOR THE SPECIALIZED COMMUNICATION RADIO AMATEUR"

	Surface U.S./Canada Mexico	Surface All Foreign	Airmail Central S. America	Airmail All Other Foreign
½ year	$ 10.00	$ 13.00	$ 20.00	$ 23.00
1 year	$ 20.00	$ 26.00	$ 40.00	$ 46.00
2 year	$ 38.00	$ 50.00	$ 78.00	$ 90.00
3 year	$ 56.00	$ 74.00	$116.00	$134.00

ATV-SSTV-FAX-RTTY-Satellites-EME
Microwave and Computers.

Published 12 times per year by Mike Stone WB0QCD
P.O. Box H, Lowden, Iowa 52255 0408



THE PROFESSIONAL TOUCH TONE ENCODER

An ultra high quality encoder for professional application. Absolute reliability and function makes the difference. There's a Pipo encoder for every system and application. Totally serviceable, easy to operate and install. ***Call or write for free catalog and information!*** (213) 852-1515 or P.O. Box 3435, Hollywood, CA 90028.

PATENTED • AT&T

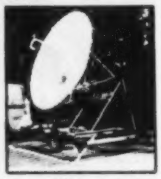
Pipo Communications®
Emphasis is on Quality & Reliability ✓300

Satellite TV

FOR THE HOME

Sick of Network TV?

Our receiver lets you get over 75 channels of television directly from earth-orbiting cable TV satellites!: HBO, Showtime, super stations, sports and movies worldwide.



We don't just sell information! We Manufacture Hardware!

From offshore oil rigs, data links to hotels and backyard installations, we wrote the book. Constantly updated, our **94 Page** technical information book and catalog gives you all the facts. Inexpensive dishes, feeds, telemetry software, kits and more. Recommended reading by NASA, The Office of Consumer Affairs and quality companies like Rockwell/Collins. Send $7.95 today!

CALL ✓309
24-hrs. C.O.D. Hotline
(305) 339-7600

© *SPACECOAST*
RESEARCH CORPORATION
P.O. Box 442-D, Altamonte Spgs, FL 32701

CERTIFIED INTERNATIONAL

YOU WILL BE GLAD YOU CHECKED WITH US FOR

CUSHCRAFT AND HUSTLER (full line at 25% off), LARSEN, UNADILLA, BELDEN, COPPERWELD, SIGNALCRAFTER, PALOMAR, NYE-VIKING, TRIONYX, TRAC, JANEL, BENCHER, VIBROPLEX, AMPHENOL, GOULD, WELLER, EVEREADY AND OTHERS

WE STOCK EVERY KIND OF WIRE THE AMATEUR NEEDS, BY BELDEN, others

CRYSTALS FRESH CUT TO YOUR ORDER FROM $4.00

QSL's CUSTOM MADE FOR YOU

CB TO 10 METER CONVERSIONS FROM THE STANDARD SETTER

CERTIFIED COMMUNICATIONS

WE CONVERT OVER 150 MODELS $45 AND UP, AND SELL NEW 10 METER RIGS WITH DOUBLE WARRANTY FROM $179.00

ASK FOR QUOTE, CATALOG, CONVERSION BOOKLET, QSL SAMPLES (INCLUDE 50 cents), OR INFORMATION.

WE BRING OUR STORE TO YOU AT OVER 70 HAMFESTS PER YEAR.
SEE YOU IN OAKRIDGE, MUSKEGON, DAYTON, ROCHESTER,MN AND MADISON,WI.

IT'S WORTH YOUR WHILE TO CALL OR WRITE

CERTIFIED INTERNATIONAL
[illegible] (616) 924 4561 Fremont, MI 49412

GO MOBILE WITH YOUR H.T.!

Model I—Icom IC-2A/T, Etc.
Model K-1 for TR-2500
—slides on bottom of radio

Guaranteed!

Model K—TR-2400;
—powered thru battery plug
Model N—FT-208R
Model T—Simple mod for Tempo

NOW FOR FT-208R & TR-2500

Model Y—FT-207R,
—fits into battery compartment

"A unique battery eliminator" HANDI-TEK Regulator allows constant hand-held operation from auto DC or base supply with no nicad drain and WITHOUT RADIO MODIFICATION! $24.95 PPD in USA. CA add $1.50 Sales Tax.

✓460
HANDI-TEK
P.O. BOX 2205, LA PUENTE, CA 91746

SYNTHESIZED SIGNAL GENERATOR

MADE IN USA

MODEL SG1000
$349.95
plus shipping

• Covers 100 to 185 MHz in 1 kHz steps with thumbwheel dial • Accuracy 1 part per 10 million at all frequencies • Internal FM adjustable from 0 to 100 kHz at a 1 kHz rate • Spurs and noise at least 60 dB below carrier • RF output adjustable from 5-500 mV at 50 ohms • Operates on 12 Vdc @ 1/2 Amp • Available for immediate delivery • $349.95 plus shipping • Add-on Accessories available to extend freq. range, add infinite resolution, voice and sub-audible tones, AM, precision 120 dB calibrated attenuator • Call for details • Dealers wanted worldwide.

VANGUARD LABS ✓311
196-23 Jamaica Ave., Hollis, NY 11423
Phone: (212) 468-2720

DIAL – YOUR – DEAL

TRADE IN

TRADE YOUR EQUIPMENT ON NEW or USED

CALL TOLL-FREE
1-800-325-3636

FOR THE BEST DEAL ON:

YAESU	ICOM	HAL
KENWOOD	SWAN	DRAKE
TEN-TEC	INFO-TECH	COLLINS

HAM RADIO CENTER

8340-42 Olive Blvd. • P.O. Box 28271 • St. Louis, MO 63132

MasterCard SEE YOU AT DAYTON VISA

MHz electronics

(602) 242-3037
(602) 242-8916
2111 W. CAMELBACK ROAD
PHOENIX, ARIZONA 85015

Introducing

TVRO CIRCUIT BOARDS

Satellite Receiver Boards—Now in Stock

DUAL CONVERSION BOARD **$25.00**
This board provides conversion from the 3.7-4.2 band first to 900 MHz where gain and bandpass filtering are provided and, second, to 70 MHz. The board contains both local oscillators, one fixed and the other variable, and the second mixer. Construction is greatly simplified by the use of Hybrid IC amplifiers for the gain stages.

SIX 47pF CHIP CAPACITORS
For use with dual conversion board **$6.00**

70 MHz IF BOARD **$25.00**
This circuit provides about 43dB gain with 50 ohm input and output impedance. It is designed to drive the HOWARD/COLEMAN TVRO Demodulator. The on-board bandpass filter can be tuned for bandwidths between 20 and 35 MHz with a passband ripple of less than ½ dB. Hybrid IC's are used for the gain stages.

SEVEN .01 pF CHIP CAPACITORS
For use with the 70 MHz IF board **$7.00**

DEMODULATOR BOARD **$40.00**
This circuit takes the 70 MHz center frequency satellite TV signals in the 10 to 200 millivolt range, detects them using a phase locked loop, de-emphasizes and filters the result and amplifies the result to produce standard NTSC video. Other outputs include the audio subcarrier, a DC voltage proportional to the strength of the 70 MHz signal, and AFC voltage centered at about 2 volts DC.

SINGLE AUDIO **$15.00**
This circuit recovers the audio signals from the 6.8 MHz frequency. The Miller 9051 coils are tuned to pass the 6.8 MHz subcarrier and the Miller 9052 coil tunes for recovery of the audio.

DUAL AUDIO **$25.00**
Duplicate of the single audio but also covers the 6.2 range.

DC CONTROL **$15.00**

SPECIAL SET OF FIVE BOARDS **$100.00**
INCLUDING DUAL AUDIO (2 single audio boards)

1900 to 2500 MHz MICROWAVE DOWNCONVERTER

MICROWAVE RECEIVER This receiver is tunable over a range of 1900 to 2500 MHz approximately, and is intended for amateur use. The local oscillator is voltage controlled, making the I.F. range approximately 54 to 88 MHz for standard TV set channels 2 thru 7.

P.C. BOARD with DATA 1 to 5	**$15.00**	6 to 11	**$13.00**	12 to 26	**$11.00**	27 - up	**$9.00**

P.C. Board with all parts for assembly **$49.99**
P.C. Board with all parts for assembly plus 2N6603 . . . . **$69.99**
P.C. Board with all chip caps soldered on . . . **$30.00**
P.C. Board assembled & tested **$69.99**
P.C. Board assembled & tested with 2N6603 **$79.99**

HMR II DOWNCONVERTER with Power Supply, Antenna (Dish) & all Cables for installation. 180 Day Warranty.
1 to 5 **$150.00** 6 to 11 **$140.00** 12 - up **$125.00**

YAGI DOWNCONVERTER with Power Supply, Antenna (Yagi) & all Cables for installation. 90 Day Warranty.
1 to 5 **$150.00** 6 to 11 **$140.00** 12 - up **$125.00**

YAGI DOWNCONVERTER as above but Kit. (NO CABLES) With Box.
1 to 5 **$125.00** 6 to 11 **$115.00** 12 - up **$100.00**

HMR II DOWNCONVERTER as above but Kit. (NO CABLES) With PVC.
1 to 5 **$125.00** 6 to 11 **$115.00** 12 - up **$100.00**

SPECIAL NEW STOCK OF CARBIDE DRILL BITS—YOUR CHOICE $1.99

1.25mm
1.45mm
3.2mm
3.3mm
1/8
3/16
5/32
7/32
13/64
19
20
24
26
29
30
31
36
37
38
39
40
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
67
68
69

Start taking calls in curious places with the revolutionary, new Cordless *Escort*® Phone.

Special Purchase—The *Escort*® Cordless Telephone!

We are pleased to announce the Escort Mark III is now available at special pricing. We bought the manufacturer's entire inventory-- and we are passing the savings on to you!

The Escort Mark III was originally designed to retail for $199.95. Now, we suggest a retail price of $169.95 to $189.95. Or, you can move them out at $149.95. In any event, you'll like the profit margins.

QUANTITY	*DEALER PRICE*	*GROSS PROFIT AT $149.95*
1—2 units	**69.75 each**	***53%***
3—5 units	**64.50 each**	***57%***
6—11 units	**62.50 each**	***58%***
12—23 units	**60.75 each**	***59%***

On all orders of 12 or more, we pay the freight! This is your opportunity to stock up for the Christmas buying season. These are ideal gift items, that will really move out!

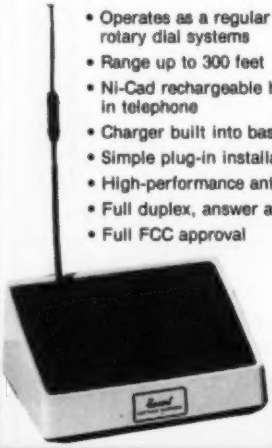
ESCORT MARK III SPECIFICATIONS

VHF DUPLEXERS

This duplexer was made for RF Harris Mobile Phones and Two Way Radios. These duplexers can be used in any mobile phone or two way radio system, along with having the capabilities to be modified for UHF use. The physical dimensions are 3 3/5″ Long, 4 2/5″ Wide, and 1 1/10″ Deep. The approximate weight is 18 oz./1 lb. 2 oz.. PRICE **$74.99**

- Operates as a regular telephone on touch-tone or rotary dial systems
- Range up to 300 feet
- Ni-Cad rechargeable batteries included in telephone
- Charger built into base transmitter
- Simple plug-in installation!
- High-performance antenna
- Full duplex, answer and dial out
- Full FCC approval

Exactly As Shown



HOW WE CUT THE CORD.

The new Cordless Phone works on a simple, highly sophisticated principle. A small base station plugs into your regular phone jack, and an electrical wall outlet. The base station then transmits any in- or out-going call to the handheld receiver, anywhere up to 300 feet.

Toll Free Number
800-528-0180
(For orders only)

MHz electronics

"FILTERS"

Collins Mechanical Filter #526-9724-010 Model F455Z32F
455KHz at 3.2KHz Wide. $15.00

Atlas Crystal Filters

5.52-2.7/8	5.52MHz/2.7KHz wide 8 pole	
5.595-2.7/8/U	5.595MHz/2.7KHz wide 8 pole upper sideband	
5.595-.500/4/CW	5.595MHz/.500KHz wide 4 pole CW	
5.595-2.7/LSB	5.595MHz/2.7KHz wide 8 pole lower sideband	
5.595-2.7/USB	5.595MHz/2.7KHz wide 8 pole upper sideband	
5.645-2.7/8	5.645MHz/2.7KHz wide 8 pole	Your Choice
9.0SB/CW	9.0MHz/ 8 pole sideband and CW	$12.99

Kokusai Electric Co. Mechanical Filter #MF-455-ZL-21H
455KHz at Center Frequency of 453.5Kc Carrier Frequency of 455Kc 2.36Kc Bandwidth
$15.00

Crystal Filters

Nikko	FX-07800C	7.8MHz	10.00
TEW	FEC-103-2	10.6935	10.00
Tyco/CD	001019880	10.7MHz 2 pole 15KHz Bw. Motorola #48D84396K01 Thru #48D84396K05	4.00
Motorola	4884863B01	11.7MHz 2 pole 15KHz Bandwidth	5.00
PTI	5350C	12MHz 2 pole 15KHz Bandwidth	5.00
PTI	5426C	21.4MHz 2 pole 15KHz Bandwidth	5.00
CD	A10300	45MHz 2 pole 15KHz Bandwidth (For Motorola Communications equipment)	5.00

Ceramic Filters

Murata	BFB455B	455KHz	$ 2.40
	CFM455E	455KHz +- 5.5KHz	6.65
	CFM455D	455KHz +- 7KHz	6.65
	CFR455E	455KHz +- 5.5KHz	8.00
	CFU455E	455KHz +- 1.5KHz	2.90
	CFU455G	455KHz +- 1KHz	2.90
	CFW455D	455KHz +- 1KHz	2.90
	CFW455H	455KHz +- 3KHz	4.35
	SFB455D	455KHz	2.40
	SFE10.7	10.7MHz	2.67
	SFG10.7MA	10.7MHz	10.00
Clevite	TO-01A	455KHz	5.00
	TO-02A	455KHz	5.00
Nippon	LF-B4/CFU455I	455KHz +- 1KHz	5.80
	LF-B6/CFU455H	455KHz +- 1KHz	5.80
	LF-C18	455KHz	10.00
Tokin	CF455A/BFU455K	455KHz +- 2KHz	4.80
Matsushira	EFC-L455K	455KHz	7.00

ROTRON MUFFIN FANS Model Mark 4/MU2A1
These fans are new factory boxed 115vac at 14watts 50/60cps. Impedance Protected-F CFM is 88 at 50cps and 105 at 60cps. $ 7.99

SPECTRA PHYSICS INC. Model 088 HeNe Laser Tubes.
Power output 1.6mw. Beam Dia. .75mm. Beam Dir. 2.7mr. 8Kv starting voltage
68K ohm 1watt ballast 1000vdc +-100vdc 3.7ma. TUBES ARE NEW $59.99

"AMPLIFIERS"

AVANTEK LOW NOISE AMPLIFIERS

Models	UTC2-102M	AP-20-T	AL-45-0-1	AK-1000M
Frequency Range	30 to 200MC	200 to 400MC	450 to 800MC	500 to 1000MC
Noise Figure	1.5dB	6.5dB	7dB	2.5dB
Voltage	+15vdc	+24vdc	-6vdc @ +12vdc	+12vdc @ -12vdc
Gain	29dB	30dB	30dB	25dB
Power Output	1dB Gain +7dBm	1dB Gain +20dBm	1dB Gain -5dBm	1dB Gain +8dBm
Price	$49.99	$49.99	$49.99	$69.99

Mini Circuits Double Balanced Mixers

Model RAY-3

Very High Level (+23dBm LO) 70KHz to 200MHz LO,RF,DC to 200MHz IF
Conversion Loss,dB One Octave From Band Edge 6Typ./7.5Max. Total Range 6.5Typ./8Max.
Isolation,dB Lower Band Edge To One Decade Higher (LO-RF/LO-IF) 55Typ./45Min. Mid. Range (LO-RF/LO-IF) 40Typ./30Min. Upper Band Edge To One Octave Lower (LO-RF/LO-IF) 30Typ./25Min.
Price $24.99

Model TSM-3

Standard Level (+7dBm LO) .1MHz to 400MHz LO,RF,DC to 400MHz IF
Conversion Loss,dB One Octave From Band Edge 5.3Typ./7.5Max. Total Range 6.5Typ./8.5Max.
Isolation,dB Lower Band Edge To One Decade Higher (LO-RF/LO-IF) 60Typ./50Min. Mid. Range (LO-RF/LO-IF) 50Typ./35Min. Upper Band Edge To One Octave Lower (LO-RF/LO-IF) 35TYP./25Min.
Price $11.99

Hewlett Packard Linear Power Microwave RF Transistor HXTR5401/35831E

Collector Base Brakedown Voltage at Ic=100ua	35volts min.
Collector Emitter Brakedown Voltage at Ic=500ua	30volts min.
Collector Cutoff Current at Vcb=15v	100ua max.
Forward Current Transfer Ratio at Vce=15v,Ic=15ma	15min,40typ,125max
Transducer Power Gain at Vce=18v,Ice=60ma,F=2GHz.	3dBmin,4dBtyp
Maximum Available Gain at Vce=18v,Ic=60ma,F=1GHz/F=2GHz	14dB typ,8dB typ
Price $29.99	

Motorola RF Power Amplifier Modules

Model	MHW612A	MHW613A	MHW710	MHW720
Frequency Range	146 to 147MHz	150 to 174MHz	400 to 512MHz	400 to 470MHz
Voltage	12.5vdc	12.5vdc	12.5vdc	12.5vdc
Output Power	20watts	30watts	13watts	20watts
Minimum Gain	20dB	20dB	19.4dB	21dB
Harmonics	-30dB	-30dB	40dB	40dB
RF Input Power	400mw	500mw	250mw	250mw
Price	$57.50	$59.80	$57.50	$69.00

Toll Free Number
800-528-0180
(For orders only)

MHz electronics

"TRANSISTORS"

WATKINS JOHNSON WJ-M62 3.7 to 4.2GHz Communication Band Double Balanced Mixer $100.00

SSB Conversion Loss 4.9dB Typ. 6dB Max. fR 3.7 to 4.2GHz
5.5dB Typ. 6.5dB Max. fI DC to 1125MHz fL fR
fI 880MHz fL fR
SSB Noise Fiqure fR 3.7 to 4.2GHz
4.9dB Typ. 6dB Max. fI 30 to 1125MHz fL fR
5.5dB Typ. 6.5dB Max. fI 880MHz fL fR
Isolation
fL at R 30dB Min. 40dB Typ. fL 2.8 to 5.35GHz
fL at I 25dB Min. 30dB Typ. fL 4.5 to 5.35GHz
20dB Min. 30dB Typ. fL 3.6 to 4.5GHz
15dB Min. 25dB Typ. fL 2.8 to 3.6GHz
Conversion Compression 1dB Max. fR Level +2dBm
Flatness .2dB Peak to Peak Over any 40MHz Segment of fR=3.7 to 4.2GHz
Third Order Input Intercept +11dBm fR1=4GHz fR2=4.01GHz Both at -5dBm fL=4.5GHz
Group Time Delay .5ns Typ. .75ns Max. fR3.7 to 4.2GHz fL 3480MHz @ +13dBm

VSWR				
	L-Port	1.25:1 Typ.	2.0:1	fL 2.8 to 5.35GHz
	R-Port	1.25:1 Typ.	2.0:1	fR 3.7 to 4.2GHz fL fR
		1.4 :1 Typ.	2.0:1	fR 3.7 to 4.2GHz fL fR
	I-Port	1.5 :1 Typ.	2.0:1	fI=100MHz
		1.3 :1 Typ.	2.0:1	fI=500MHz
		1.8 :1 Typ.	2.5:1	fI=1125MHz

SGS/ATES RF Transistors			Motorola RF Transistor	
Type.	BFQ85	BFW92	MRF901	2N6603
Collector Base V	20v	25v	25v	25v
Collector Emitter V	15v	15v	15v	15v
Emitter Base V	3v	2.5v	3v	3v
Collector Current	40ma	25ma	30ma	30ma
Power Dissipation	200mw	190mw	375mw	400mw
HFE	40min. 200max.	20min. 150max.	30min. 200max.	30min. 200max.
FT	4GHZ min. 5GHz max.	1.6GHz Typ.	4.5GHz typ.	2GHz min.
Noise Fiqure	1GHz 3dB Max.	500MHz 4dB Typ.	1GHz 2dB Typ.	2GHz 2.9dB Typ.
Price	$1.50	$1.50	$2.00	$10.00

National Semiconductor Variable Voltage Regulator Sale !!!!!!!!!

LM317K	LM350K	LM723G/L	LM7805/06/08/12/15/18/24
1.2 to 37vdc	1.2 to 33vdc	2 to 37vdc	5, 6, 8,12,15,18,24vdc
1.5Amps	3Amps	150ma.	1Amp
TO-3	TO-3	TO-100/TO-116	TO-220/TO-3
$4.50	$5.75	$1.00 $1.25	$1.17 $2.00

P & B Solid State Relays Type ECT1DB72
5VDC Turn On 120VAC Contact 7Amps
20Amps on 10"x10"x.062" Alum.Heatsink with
Silicon Grease $5.00

*May Be Other Brand Equivalent

Toll Free Number
800-528-0180
(For orders only)

MHz electronics

"MIXERS"

WATKINS JOHNSON WJ-M6 Double Balanced Mixer

LO and RF 0.2 to 300MHz	IF DC to 300MHz	$21.00
Conversion Loss (SSB)	6.5dB Max. 1 to 50MHz	
	8.5dB Max. .2 to 300MHz	WITH DATA SHEET
Noise Figure (SSB)	same as above	
	8.5dB Max. 50 to 300MHz	
Conversion Compression	.3dB Typ.	

NEC (NIPPON ELECTRIC CO. LTD. NE57835/2SC2150 Microwave Transistor

NF Min	F=2GHz	dB 2.4 Typ.	MAG	F=2GHz	dB 12 Typ.	$5.30
	F=3GHz	dB 3.4 Typ.		F=3GHz	dB 9 Typ.	
	F=4GHz	dB 4.3 Typ.		F=4GHz	dB 6.5 Typ.	

Ft Gain Bandwidth Product at Vce=8v, Ic=10ma. GHz 4 Min. 6 Typ.
Vcbo 25v Vceo 11v Vebo 3v Ic 50ma. Pt. 250mw

UNELCO RF Power and Linear Amplifier Capacitors

These are the famous capacitors used by all the RF Power and Linear Amplifier manufacutures and described in the Motorola RF Data Book.

10pf	22pf	30pf	40pf	100pf	250pf	1 to 10pcs.	.60¢ each
13pf	25pf	32pf	43pf	120pf	820pf	11 to 50pcs.	.50¢ each
14pf	27pf	33pf	62pf	180pf		51 to 100pcs.	.40¢ each
20pf	27.5pf	34pf	80pf	200pf			

NIPPON ELECTRIC COMPANY TUNNEL DIODES

$7.50

		MODEL 1S2199	1S2200
Peak Pt. Current ma.	Ip	9min. 10Typ. 11max.	9min. 10Typ. 11max.
Valley Pt. Current ma.	Iv	1.2Typ. 1.5max.	1.2Typ. 1.5max.
Peak Pt. Voltage mv.	Vp	95Typ. 120max.	75Typ. 90max.
Projected Peak Pt. Voltage mv.	Vpp Vf=Ip	480min. 550Typ. 630max.	440min. 520Typ. 600max.
Series Res. Ohms	rS	2.5Typ. 4max.	2Typ. 3max.
Terminal Cap. pf.	Ct	1.7Typ. 2max.	5Typ. 8max.
Valley Pt. Voltage mv.	VV	370Typ.	350Typ.

FAIRCHILD / DUMONT Oscilloscope Probes Model 4290B

Input Impedance 10 meg., Input Capacity 6.5 to 12pf., Division Ration (Volts/Div Factor) 10:1, Cable Length 4Ft. , Frequency Range Over 100MHz.
These Probes will work on all Tektronix, Hewlett Packard, and other Oscilloscopes.

PRICE $45.00

MOTOROLA RF DATA BOOK

List all Motorola RF Transistors / RF Power Amplifiers, Varactor Diodes and much much more.

PRICE $7.50

Toll Free Number
800-528-0180
(For orders only)

MHz electronics

"SOCKETS AND CHIMNEYS"

EIMAC TUBE SOCKETS AND CHIMNEYS

SK110	Socket	$ POR	SK626	Chimney	$ 7.70
SK406	Chimney	35.00	SK630	Socket	45.00
SK416	Chimney	22.00	SK636B	Chimney	26.40
SK500	Socket	330.00	SK640	Socket	27.50
SK506	Chimney	47.00	SK646	Chimney	55.00
SK600	Socket	39.50	SK711A	Socket	192.50
SK602	Socket	56.00	SK740	Socket	66.00
SK606	Chimney	8.80	SK770	Socket	66.00
SK607	Socket	43.00	SK800A	Socket	150.00
SK610	Socket	44.00	SK806	Chimney	30.80
SK620	Socket	45.00	SK900	Socket	253.00
SK620A	Socket	50.50	SK906	Chimney	44.00

JOHNSON TUBE SOCKETS

124-115-2/SK620A	Socket	$ 30.00	124-113	Bypass Cap.	$ 10.00
124-116/SK630A	Socket	40.00	122-0275-001	Socket (For 4-250A,4-400A,3-400Z, 3-500Z)	10.00 2/$15.00

CHIP CAPACITORS

.8pf
1pf
1.1pf
1.4pf
1.5pf
1.8pf
2.2pf
2.7pf
3.3pf
3.6pf
3.9pf
4.7pf
5.6pf
6.8pf
8.2pf
10pf
12pf
15pf
18pf
20pf
22pf
24pf
27pf
33pf
39pf
47pf
51pf
56pf
68pf
82pf
100pf*
110pf
120pf
130pf
150pf
160pf
180pf
200pf
220pf*
240pf
270pf
300pf
330pf
360pf
390pf
430pf
470pf
510pf
560pf
620pf
680pf
820pf
1000pf/.001uf*
1800pf/.0018uf
2700pf/.0027uf
10,000pf/.01uf
12,000pf/.012uf
15,000pf/.015uf
18,000pf/.018uf

PRICES:	1 to 10 -	.99¢	101 to 1000	.60¢	* IS A SPECIAL PRICE:	10 for $7.50
	11 to 50 -	.90¢	1001 & UP	.35¢		100 for $65.00
	51 to 100 -	.80¢				1000 for $350.00

WATKINS JOHNSON WJ-V907: Voltage Controlled Microwave Oscillator $110.00

Frequency range 3.6 to 4.2GHz, Power ouput, Min. 10dBm typical, 8dBm Guaranteed. Spurious output suppression Harmonic (nf_0), min. 20dB typical, In-Band Non-Harmonic, min. 60dB typical, Residual FM, pk to pk, Max. 5KHz, pushing factor, Max. 8KHz/V, Pulling figure (1.5:1 VSWR), Max. 60MHz, Tuning voltage range +1 to +15volts, Tuning current, Max. -0.1mA, modulation sensitivity range, Max. 120 to 30MHz/V, Input capacitance, Max. 100pf, Oscillator Bias +15 +-0.05 volts @ 55mA, Max.

Toll Free Number
800-528-0180
(For orders only)

MHz electronics

"TUBES"

TUBES	PRICE
2E26	$ 4.69
2K28	100.00
3B28	5.00
3-500Z	102.00
3-1000Z/8164	300.00
3CX1000A/8283	200.00
3X2500A3	200.00
4-65A/8165	45.00
4-125A/4D21	58.00
4-250A/5D22	68.00
4-400A/8438	71.00
4-400C/6775	80.00
4-1000A/8166	300.00
4CS250R	69.00
4X150A/7034	30.00
4X150D/7035	40.00
4X150G	50.00
4X250B	30.00
4CX250B/7203	45.00
4CX250F/7204	45.00
4CX250FG/8621	55.00
4CX250K/8245	100.00
4CX250R/7580W	69.00
4CX300A	99.00
4CX350A/8321	100.00
4CX350FJ/8904	100.00
4X500A	100.00
4CX600J	300.00
4CX1000A/8168	300.00
4CX1500B/8660	300.00
4CX3000A/8169	300.00
4CX5000A/8170	400.00
4CX10000D/8171	500.00
4CX15000A/8281	700.00
4E27/A/5-123A/B	40.00
4PR60A	100.00
4PR60B/8252	175.00
KT88	15.00
DX362	35.00
DX415	35.00
572B/T160L	44.00
811	10.00
811A	13.00
812A	15.00
813	38.00
4624	100.00
4665	350.00
5551A	100.00
5563A	77.00
5675	15.00

TUBES	PRICE
5721	$200.00
5768	85.00
5836	100.00
5837	100.00
5861/EC55	110.00
5876A	15.00
5881/6L6	5.00
5894/A	45.00
5894B	55.00
6080	10.00
6083/AX9909	89.00
6098/6AK6	14.00
6115/A	100.00
6146	6.00
6146A	6.50
6146B/8298A	7.50
6146W	14.00
6159	11.00
6161	70.00
6291	125.00
6293	20.00
6360	4.00
6524	53.00
6550	7.00
6562/6794A	25.00
6693	110.00
6816	58.00
6832	22.00
6883/8032A/8552	7.00
6884	46.00
6897	110.00
6900	35.00
6907	55.00
6939	15.00
7094	75.00
7117	17.00
7211	60.00
7289/3CX100A5	34.00
7360	11.00
7377	67.00
7486	75.00
7650	250.00
7843	58.00
7868	4.00
7984	12.00
8072	55.00
8121	50.00
8122	85.00
8236	30.00
8295/PL172	300.00

TUBES	PRICE
8462	$100.00
8505A	73.50
8533W	92.00
8560A	55.00
8560AS	57.00
8608	34.00
8624	67.20
8637	38.00
8647	123.00
8737/5894B	55.10
8807	1000.00
8873	260.00
8874	260.00
8875	260.00
8877	533.00
8908	12.00
8916	1500.00
8930/X651Z	45.00
8950	10.00
6BK4C	5.00
6DQ5	4.00
6FW5	5.00
6GE5	5.00
6GJ5	5.00
6HS5	5.00
6JB5/6HE5	5.00
6JB6A	5.00
6JM6	5.00
6JN6	5.00
6JS6B	5.00
6JT6A	5.00
6KD6	5.00
6K66/EL505	5.50
6KM6	5.00
6KN6	5.00
6LF6	6.00
6LQ6	6.00
6LU8	5.00
6LX6	5.00
6ME6	5.00
12JB6A	6.00

"WE ARE ALSO LOOKING FOR TUBES NEW/USED ECT."

WE BUY SELL OR TRADE

NOTICE ALL PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

Toll Free Number
800-528-0180
(For orders only)

MHz electronics

TEKTRONIX OSCILLOSCOPES	PRICE
MODEL 453 Portable 50 MHz Dual Trace.	$1200.00
MODEL 453A Portable 60 MHz Dual Trace.	$1400.00
MODEL 454 Portable 150 MHz Dual Trace.	$1800.00
MODEL 454A Portable 150 MHz Dual Trace.	$2000.00
MODEL 455 Portable 50 MHz Dual Trace.	$1800.00
MODEL 475 Portable 200 MHz Dual Trace.	$2640.00
MODEL 475A Portable 250 MHz Dual Trace.	$2940.00
MODEL 7514 Storage Oscilloscope with a 7A15A and a 7A15AN-11 Amplifier and a 7B50 Time Base.	$3500.00
MODEL 577D1 Storage Curve Tracer with a 177 adapter.	$3233.00
MODEL 577D2 Curve Tracer with a 177 adapter.	$2796.00
Tektronix Lab Cart Model 3	$ 316.00
MODEL 547 50 MHz Bench Scope.	
With a 1A1 Dual Trace.	$ 722.50
With a 1A2 Dual Trace.	$ 637.50
With a 1A4 Quad Trace.	$ 872.50
With a 1A5 Differential.	$ 722.50
With a 1A6 Differential.	$ 612.50
or with 1 of each above.	$1667.50
MODEL 545 30 MHz Bench Scope with a CA Dual Trace.	$ 412.50
MODEL 545A 30 MHz Bench Scope with a CA Dual Trace.	$ 437.50
MODEL 544 50 MHz Bench Scope with a CA Dual Trace.	$ 650.50
MODEL 543A 33 MHz Bench Scope with a CA Dual Trace.	$ 475.50

HEWLETT PACKARD OSCILLOSCOPES	PRICE
MODEL 180A Main Frame.	$ 675.00
MODEL 180E Main Frame.	$ 750.00
MODEL 181A Main Frame.	$1000.00
MODEL 182A Main Frame.	$ 900.00
MODEL 183A Main Frame.	$1000.00
MODEL 180 SERIES PLUG-INS	
1801A Dual Trace 50 MHz.	$ 495.00
1803A Differential.	$ 775.00
1804A Quad Trace 50 MHz	$ 795.00
1807A Dual Trace 50 MHz	$ 375.00
1815A TDR/Sampler with a 1816A DC to 4 GHz.	$1500.00
1821A Time Base & Delay Generator.	$ 495.00
1822A Time Base & Delay Generator.	$ 525.00
1831A Direct Access 600 MHz.*	$ 200.00
1840A Time Base & Delay Generator.*	$ 450.00
1841A Time Base & Delay Generator.*	$ 675.00
*For 183A Only. !!!!!!!!	
TELEQUIPMENT MODEL D83 Oscilloscope Dual Trace Portable 50 MHz. With a V4 and S2A Plug-In.	$1200.00
DUMONT MODEL 1062 Oscilloscope Dual Trace 65 MHz portable.	$ 750.00
TEKTRONIX	
MODEL RM565 Dual Beam Oscilloscope 10 MHz with a 3A6 Dual Trace and a 3A72 Dual Trace.	$1107.50
MODEL 549 Storage Oscilloscope Bench 50 MHz with a CA Dual Trace.	$1000.00
MODEL 647A Oscilloscope Bench 100 MHz with a 10A2 Dual Trace and a 11B2A Time Base.	$1200.00

ORDERING INSTRUCTIONS

DEFECTIVE MATERIAL: All claims for defective material must be made within sixty (60) days after receipt of parcel. All claims must include the defective material (for testing purposes), our invoice number, and the date of purchase. All returns must be packed properly or it will void all warranties.

DELIVERY: Orders are normally shipped within 48 hours after receipt of customer's order. If a part has to be backordered the customer is notified. Our normal shipping method is via First Class Mail or UPS depending on size and weight of the package. On test equipment it is by Air only, FOB shipping point.

FOREIGN ORDERS: All foreign orders must be prepaid with cashier's check or money order made out in U.S. Funds. We are sorry but C.O.D. is not available to foreign countries and Letters of Credit are not an acceptable form of payment either. Further information is available on request.

HOURS: Monday thru Saturday: 8:30 a.m. to 5:00 p.m.

INSURANCE: Please include 25¢ for each additional $100.00 over $100.00, United Parcel only.

ORDER FORMS: New order forms are included with each order for your convenience. Additional forms are available on request.

POSTAGE: Minimum shipping and handling in the US, Canada, and Mexico is $2.50 all other countries is $5.00. On foreign orders include 20% shipping and handling.

PREPAID ORDERS: Order must be accompanied by a check.

PRICES: Prices are subject to change without notice.

RESTOCK CHARGE: If parts are returned to MHZ Electronics due to customer error, customer will be held responsible for all extra fees, will be charged a 15% restocking fee, with the remainder in credit only. All returns must have approval.

SALES TAX: Arizona must add 5% sales tax, unless a signed Arizona resale tax card is currently on file with MHZ Electronics. All orders placed by persons outside of Arizona, but delivered to persons in Arizona are subject to the 5% sales tax.

SHORTAGE OR DAMAGE: All claims for shortages or damages must be made within 5 days after receipt of parcel. Claims must include our invoice number and the date of purchase. Customers which do not notify us within this time period will be held responsible for the entire order as we will consider the order complete.

OUR 800 NUMBER IS STRICTLY FOR ORDERS ONLY
NO INFORMATION WILL BE GIVEN. 1-800-528-0180.

FAIRCHILD VHF AND UHF PRESCALER CHIPS		PRICE
95H90DC	350MC Prescaler divide by 10/11	$ 8.50
95H91DC	350MC Prescaler divide by 5/6	8.50
11C90DC	650MC Prescaler divide by 10/11	15.50
11C91DC	650MC Prescaler divide by 5/6	15.50
11C06DC	UHF Prescaler 750MC D Type Flip Flop	12.30
11C05DC	1GHz Counter Divide by 4 (Regular price $75.00)	50.00
11C01FC	High Speed Dual 5/4 Input NO/NOR Gate	15.40
82S90	Presettable High Speed Decade/Binary Counter used with the 11C90/91 or the 95H90/91 Prescaler can divide by 100. (Signetics)	5.00
11C24DC	This chip is the same as a Motorola MC4024/4324 Dual TTL Voltage Control Multivibrator.	3.37
11C44DC	This chip is the same as a Motorola MC4044/4344 Phase Frequency Detector.	3.37

GENERAL ELECTRIC CO. GUNN DIODE MODEL Y-2167
Freq. Gap (GHZ) 12 to 18, Output (Min.) 100mW, Duty (%) CW, Typ. Bias (Vdc) 8.0, Type. Oper. (MAdc) 550, Max. Thres. (mAdc) 1000, Max. Bias (Vdc) 10.0. **$39.99**

VARIAN GALLIUM ARSENIDE GUNN DIODES MODEL VSX-9201S5
Freq. Coverage 8 to 12.4GHz, Output (Min.) 100mW, Bias Voltage (Max.) 14vdc, Bias current (mAdc) Operating 550 Typ. 750 Max., Threshold 850 Tup. 1000 Max. **$39.99**

VARI-L Co. Inc. MODEL SS-43 AM MODULATOR
Freq. Range 60 10 150MC, Insertion Loss 13dB Nominal, Signal Port Imp. 50ohms Nominal, Signal Port RF Power + 10dBm Max., Modulation Port BW DC to 1KHZ, Modulation Port Bias 1ma. Nominal. **$24.99**

AVANTEK CASCADABLE MODULAR AMPLIFIERS	Model UTO-504	UTO-511
Frequency Range	5 to 500 MHz	5 to 500 MHz
Gain	6dB	15dB
Noise Figure	11dB	2.3dB to 3dB
Power Output	+ 17dB	− 2dB to − 3dB
Gain Flatness	1dB	1dB
Input Power Vdc	+ 24	+ 15
mA	100	10
PRICE	$70.00	PRICE $75.00

HEWLETT PACKARD MIXERS MODELS	10514A	10514B
Frequency Range	2MHz to 500MC	2MHz to 500MC
Input/Output Frequency L & R	200KHz to 500MC	200KHz to 500MC
X	DC to 500MC	DC to 500MC
Mixer Conversion Loss (A)	7dB	7dB
(B)	9dB	9dB
Noise Performance (SSB) (A)	7dB	7dB
(B)	9dB	9dB
PRICE	$49.99	PRICE $39.99

FREQUENCY SOURCES, INC MODEL MS-74X MICROWAVE SIGNAL SOURCE
MS-74X: Mechanically Tunable Frequency Range (MHz) 10630 to 11230 (10.63 to 11.23GHz) Minimum Output Power (mW) 10, Overall Multiplier Ratio 108, Internal Crystal Oscillator Frequency Range (MHz) 98.4 to 104.0, Maximum Input Current (mA) 400.

The signal source are designed for applications where high stability and low noise are of prime concern. these sources utilize fundamental transistor oscillators with high Q coaxial cavities, followed by broadband stable step recovery diode multipliers. This design allows single screw mechanical adjustment of frequency over standard communications bands. Broadband sampling circuits are used to phase lock the oscillator to a high stability reference which may be either an internal self-contained crystal oscillator, external primary standard or VHF synthesizer. This unique technique allows for optimization of both FM noise and long term stability. List Price is $1158.00 (THESE ARE NEW) **Our Price—$289.**

HEWLETT PACKARD 1N5712 MICROWAVE DIODE
This diode will replace the MBD101, 1N5711, 5082-2800, 5082-2835 ect. This will work like a champ in all those Down Converter projects. **$1.50 or 10/$10.00**

MOTOROLA MHW1172R LOW DISTORTION WIDEBAND AMPLIFIER MODULE.
Frequency Range: 40 to 300 MHz., Power Gain at 50MHz 16.6min. to 17.4max., Gain Flatness ± 0.1 Typ. ± 0.2 Max. dB., DC Supply Voltage − 28vdc, RF Voltage Input + 70dBmV **PRICE $29.99**

GENERAL ELECTRIC AA NICADS
Model #41B905HD11-G1
Pack of 6 for $5.00 or 60 Cells, 10 Packs for $45.00
These may be broken down to individual cells.

ORDERING INSTRUCTIONS

TERMS: DOMESTIC: Prepaid, C.O.D. or Credit Card
FOREIGN: Prepaid only, U.S. Funds—money order or cashier's check only.

C.O.D.: Acceptable by telephone or mail. Payment from customer will be by cash, money order or cashier's check. We are sorry but we cannot accept personal checks for C.O.D.'s.

CONFIRMING ORDERS: We would prefer that confirming orders not be sent after a telephone order has been placed. If company policy necessitates a confirming order, please mark "CONFIRMING" boldly on the order. If problems or duplicate shipments occur due to an order which is not properly marked, customers will be held responsible for any charges incurred, plus a 15% restock charge on returned parts.

CREDIT CARDS: We are now accepting Mastercard and Visa.

DATA SHEETS: When we have data sheets in stock on devices we do supply them with the order.

(602) 242-3037
(602) 242-8916
2111 W. CAMELBACK ROAD
PHOENIX, ARIZONA 85015

MHz electronics ✓48

Toll Free Number
800-528-0180
(For orders only)

FULL LINE ALL PARTS & COMPUTER PRODUCTS

Quest ELECTRONICS

P.O. Box 4430M
Santa Clara, CA 95054
Will calls: 2322 Walsh Ave.
(408) 988-1640

✓60

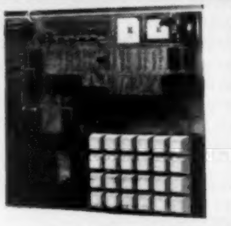
Same day shipment. First line parts only. Factory tested. Guaranteed money back. Quality IC's and other components at factory prices.

INTEGRATED CIRCUITS **Phone orders only (800) 538-8196**

[illegible]

1981 IC MASTER CLOSEOUT $59.95

4116 200ns Dynamic RAM 8/$15.40



RCA Cosmac 1802 Super Elf Computer $106.95

The Super Elf is a small single board computer that does many **big** things. It's an excellent computer for training and for learning programming with its machine language and yet it's easily **expanded** with **additional memory, Full Basic, ASCII Keyboards, video character generation, etc.**

ROM monitor; State and Mode displays; Single step; Optional address displays; Power Supply; Audio Amplifier and Speaker; Fully socketed for all IC's; Full documentation.

The **Super Elf** includes a **ROM** monitor for program loading, editing and execution with **SINGLE STEP for program debugging** which is not included in others at the same price. With **SINGLE STEP** you can see the microprocessor chip operating with the **unique Quest** address and data bus displays **before, during** and **after** executing instructions. Also, CPU mode and instruction cycle are decoded and displayed on 8 LED indicators.

An RCA 1861 **video graphics** chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a **speaker system** included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

A 24 key **HEX keyboard** includes 16 HEX keys plus **load, reset, run, wait, input, memory protect, monitor select** and **single step**. Large, on board displays provide output and optional **high and low address**. There is a 44 pin standard connector slot for PC cards and a 50 pin connector slot for the Quest Super Expansion Board. Power supply and sockets for **all** IC's are included plus a detailed 127 pg. instruction manual which now includes over 40 pgs. of software info. including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D.

Remember, other computers only offer Super Elf features at additional cost or not at all. **Compare before you buy. Super Elf Kit $106.95, High address option $8.95, Low address option $9.95. Custom Cabinet** with drilled and labelled plexiglass front panel **$24.95.** All metal Expansion Cabinet, painted and silk screened, with room for 5S-100 boards and power supply **$57.00. NiCad Battery Memory Saver Kit $6.95.** All kits and options also completely assembled and tested.

Questdata, a software publication for 1802 computer users is available by subscription for $12.00 per 12 issues. Single issues $1.50. Issues 1-12 bound $16.50.

Moews Video Graphics **$3.50**, Games and Music **$3.00**, Chip 8 Interpreter **$5.50**, Starship 4K cassette **$14.95**. Exciting and challenging space game. Complete manual included.

Quest Super Basic V5.0

A new enhanced version of **Super Basic** now available. Quest was the first company worldwide to ship a full size Basic for 1802 Systems. A complete function **Super Basic** by **Ron Cenker** including floating point capability with scientific notation (number range $\pm .17E^{38}$), 32 bit integer ± 2 billion; multi dim arrays, string arrays; string manipulation; cassette I/O; save and load, basic, data and machine language programs; and over 75 statements, functions and operations.

New improved faster version including **renumber** and essentially **unlimited variables.** Also, an exclusive user expandable command library.

Serial and Parallel I/O routines included.

Super Basic on Cassette $55.00.

Free 14 page brochure of complete Super Elf system.

Super Expansion Board with Cassette Interface $89.95

This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface.** Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf.** The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed.** EPROM can be used for the monitor and Tiny Basic or other purposes.

A 1K Super ROM Monitor $19.95 is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports** with **full handshake.** They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50. A 50 pin connector set** with ribbon cable is available at **$18.95** for easy connection between the **Super Elf** and the **Super Expansion Board.**

Power Supply Kit for the complete system (see Multi-volt Power Supply below).

ELECTRONIC SYSTEMS KITS

Apple Peripheral Kits

SERIAL I/O INTERFACE 0 to 30,000 baud, D.T.R., Input & output from monitor or basic, or use Apple as intelligent terminal, Bd only (P/N 2) **$14.95**, Kit (P/N 2A) **$51.25**, Assembled (P/N 2C) **$62.95.**

PROTOTYPING BOARD (P/N 7907) **$21.95.**

PARALLEL TRIAC OUTPUT BOARD 8 triacs, each can switch 110V, 6A loads, Bd only (P/N 210) **$19.20**, Kit (P/N 210A) **$119.55.**

OPTO-ISOLATED INPUT BOARD 8 inputs, can be driven from TTL logic, Bd only (P/N 120) **$15.65**, Kit (P/N 120A) **$69.95.**

Interface Kits

SERIAL/PARALLEL INTERFACE Bidirectional, Baud rates from 110 to 19.2K, sw selectable polarity of input and output strobe, 5 to 8 data bits, 1 or 2 stop bits, parity odd or even or none, all characters contain a start bit, +5 & −12V required. Bd only (P/N 101) **$11.95**, Kit (P/N 101A) **$42.89.**

RS-232/TTL INTERFACE Bidirectional, requires ±12V, Kit (P/N 232A) **$9.95.**

RS-232/20mA INTERFACE Bidirectional, 2 passive opto-isolated circuits, Kit (P/N 7901A) **$14.95.**

PROM Eraser

Will erase 25 PROMs in 15 minutes. Ultraviolet, assembled. 25 PROM capacity **$37.00** (with timer **$69.50**). 6 PROM capacity OSHA/UL version **$78.50** (with timer **$108.50**).

NiCad Battery Fixer/Charger Kit

Opens shorted cells that won't hold a charge and then charges them up, all in one kit w/full parts and instructions. No PC board. **$8.95**

Z80 Microcomputer

16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board **$28.50.** Full Kit **$99.00.** Monitor **$20.00.** Power Supply Kit **$35.00.** Tiny Basic **$30.00.**

Modem Kit $60.00

State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud. Inexpensive acoustic coupler plans included. Bd. only $17.00. Article in June *Radio Electronics.*

60 Hz Crystal Time Base Kit $4.40

Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

Video Modulator Kit $9.95

Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

Multi-volt Computer Power Supply

8v 5 amp, ±18v .5 amp, 5v 1.5 amp, −5v .5 amp, 12v .5 amp, −12v option. ±5v, ±12v are regulated. Basic Kit **$35.95.** Kit with chassis and all hardware **$51.95.** Add $5.00 shipping. Kit of hardware **$16.00.** Woodgrain case **$10.00.** $1.50 shipping.

Type-N-Talk by Votrax

Text to speech synthesizer with unlimited vocabulary, built-in text to speech algorithm, 70 to 100 bits per second speech synthesizer, RS232C interface **$359.00.** Speech IC **$79.95.**

1802 16K Dynamic RAM Kit $149.00

Expandable to 64K. Hidden refresh w/clocks up to 4 MHz w/no wait states. Addl. 16K RAM **$25.00.**

S-100 4-slot expansion $ 9.95
Super Monitor VI.I Source Listing $15.00

Rockwell AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char. alphanumeric display ROM monitor; fully expandable. **$419.00.** 4K version **$449.00.** 4K Assembler **$35.00.** 8K Basic Interpreter **$65.00.**

Special small power supply 5V 2A 24V .5A assem. in frame **$59.00.** Molded plastic enclosure to fit both AIM 65 and power supply **$52.50.** AIM 65 1K in cabinet with power supply, switch, fuse, cord assem. **$559.00.** 4K **$579.00.** ~~A65/40-5000 AIM 65/40 w/16K RAM and monitor~~ **$1295.00.** RAM Board Kit (16K, **$195**) (32K, **$215**). VD640 Video Interface Kit **$119.00.** A&T **$149.00.** Complete AIM 65 in thin briefcase with power supply **$518.00.** Special Package Price: 4K AIM, 8K Basic, power supply, cabinet **$629.00.**

AIM 65/KIM/SYM/Super Elf 44 pin expansion board; board with 3 connectors **$22.95.**

Elf II Adapter Kit $24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional **$18.00.**

Super Color S-100 Video Kit $129.95

Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80, etc. **Dealers: Send for excellent pricing/margin program.**

TERMS: $5.00 min. order U.S. Funds. Calif. residents add 6% tax.
$10.00 min. VISA and MasterCard accepted. $1.00 insurance optional.
Shipping: Add 5%; orders under $25.00—10%.

Prices subject to change

FREE: Send for your copy of our NEW 1982 QUEST CATALOG. Include 88¢ stamp.

RAMSEY ELECTRONIC'S Inc. ✓62

PARTS WAREHOUSE

We now have available a bunch of goodies too good to bypass. Items are limited so order today

2575 Baird Rd.
Penfield, NY 14526
716-586-3950

Call Your Phone Order in Today

TERMS: Satisfaction guaranteed or money refunded. C.O.D. add $2.00. Minimum order $6.00. Orders under $10.00 add $1.50. Add 5% for postage, insurance, handling. Overseas add 15%. N.Y. residents add 7% tax.

MINI KITS - YOU HAVE SEEN THESE BEFORE NOW HERE ARE OLD FAVORITE AND NEW ONES TOO. GREAT FOR THAT AFTERNOON HOBBY.

FM MINI MIKE

A super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes case, mike, on-off switch, antenna, battery and super instructions. This is the finest unit available.

FM-3 Kit	$14.95
FM-3 Wired and Tested	19.95

Color Organ

See music come alive! 3 different lights flicker with music. One light each for, high, mid-range and lows. Each individually adjustable and drives up to 300 W. runs on 110 VAC.

Complete kit, ML-1
$8.95

Video Modulator Kit

Converts any TV to video monitor. Super stable, tunable over ch 4-6. Runs on 5-15V, accepts std video signal. Best unit on the market! Complete kit, VD-1 **$7.95**

Led Blinky Kit

A great attention getter which alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights, anything! Runs on 3 to 15 volts.
Complete kit, BL-1
$2.95

Super Sleuth

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2 W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker.
Complete kit, BN-9 **$5.95**

CPO-1

Runs on 3-12 Vdc 1 wall out, 1 KHZ good for CPO, Alarm, Audio Oscillator. Complete kit **$2.95**

FM Wireless Mike Kit

Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.

FM-1 kit **$3.95** FM-2 kit **$4.95**

Whisper Light Kit

An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC.
Complete kit, WL-1
$6.95

Tone Decoder

A complete tone decoder on a single PC board. Features: 400-5000 Hz adjustable range via 20 turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.
Complete kit, TD-1 **$5.95**

Universal Timer Kit

Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs.

UT-5 Kit **$5.95**

Mad Blaster Kit

Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC

MB-1 Kit **$4.95**

Siren Kit

Produces upward and downward wail characteristic of a police siren. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker.
Complete kit, SM-3 **$2.95**

60 Hz Time Base

Runs on 5-15 VDC. Low current (2.5ma) 1 min/month accuracy

TB-7 Kit	$5.50
TB-7 Assy	$9.95

PARTS PARADE

IC SPECIALS

LINEAR

301	$ .35
324	$1.50
380	$1.50
555	$ .45
556	$1.00
565	$1.00
566	$1.00
567	$1.25
741	10/$2.00
1458	$ .50
3900	$ .50
3914	$2.95
8038	$2.95

TTL

74S00	$ .40
7447	$ .65
7475	$ .50
7490	$ .50
74196	$1.35

SPECIAL

11C90	$15.00
10116	$ 1.25
7208	$17.50
7207A	$ 5.50
7216D	$21.00
7107C	$12.50
5314	$ 2.95
5375AB/G	$ 2.95
7001	$ 6.50

CMOS

4011	.50
4013	.50
4046	$1.85
4049	.50
4059	$9.00
4511	$2.00
4518	$1.35
5639	$1.75

FERRITE BEADS

With info and specs	15/$1.00
6 Hole Balun Beads	5/$1.00

READOUTS

FND 359 .4" C C	$1.00
FND 507/510 .5" C A	1.00
MAN 72/HP7730 .33" C A	1.00
HP 7651 .43" C A	2.00

Sockets

8 Pin	10/$2.00
14 Pin	10/$2.00
16 Pin	10/$2.00
24 Pin	4/$2.00
28 Pin	4/$2.00
40 Pin	3/$2.00

TRANSISTORS

2N3904 NPN C+F	15/$1.00
2N3906 PNP C+F	15/$1.00
2N4403 PNP C+F	15/$1.00
2N4410 NPN C+F	15/$1.00
2N4916 FET C+F	4/$1.00
2N5401 PNP C+F	5/$1.00
2N6028 C+F	4/$1.00
2N3771 NPN Silicon	$1.50
2N5179 UHF NPN	3/$2.00
Power Tab NPN 40W	3/$1.00
Power Tab PNP 40W	3/1.00
MPF 102/2N5484	$.50
NPN 3904 Type T+R	50/$2.50
PNP 3906 Type T+R	50/$2.50
2N3055	$.60
2N2646 UJT	3/$2.00

Diodes

5.1 V Zener	20/$1.00
1N914 Type	50/$1.00
1KV 2Amp	8/$1.00
100V 1Amp	15/$1.00

25 AMP
100V Bridge
$1.50 each

Mini-Bridge 50V
1 AMP
2 for $1.00

Resistor Ass't

Assortment of Popular values - ¼ watt. Cut lead for PC mounting, ½" center, ¼" leads, bag of 300 or more **$1.50**

Crystals

3 579545 MHZ	$1.50
10 00000 MHZ	$5.00
5 248800 MHZ	$5.00

Switches

Mini toggle SPDT	$1.00
Red Pushbuttons N.O.	3/$1.00

AC Adapters

Good for clocks, nicad chargers, all 110 VAC plug one end

8.5 vdc @ 20 mA	$1.00
16 vac @ 160mA	$2.50
12 vac @ 250mA	$3.00

Earphones

3" leads, 8 ohm, good for small tone speakers, alarm clocks, etc.
5 for $1.00

Mini 8 ohm Speaker

Approx 2¼" diam. Round type for radios, mike etc.
3 for $2.00

Solid State Buzzers

small buzzer 450 Hz, 86 dB sound output on 5-12 vdc at 10-30 mA, TTL compatible **$1.50**

Slug Tuned Coils

Small 3/16" Hex Slugs turned coil 3 turns 10 for $1.00

AC Outlet

Panel Mount with Leads
4/$1.00

CAPACITORS

TANTALUM Dipped Epoxy		ALUMINUM Electrolytic		DISK CERAMIC	
1.5 uF 25V	3/$1.00	1000 uF 16V Radial	$.50	01 16V disk	20/$1.00
1.8 uF 25V	3/$1.00	500 uF 20V Axial	$.50	1 16V	15/$1.00
.22 uF 25V	3/$1.00	150 uF 16V Axial	5/$1.00	001 16V	20/$1.00
		10 uF 15V Radial	10/$1.00	100 pF	20/$1.00
				047 16V	20/$1.00

DC-DC Converter

+5 vdc input prod. -9 vdc @ 30ma
+9 vdc produces -15 vdc @ 35ma **$1.25**

Ceramic IF Filters

Mini ceramic filters 7 kHz B.W. 455 kHz $1.50 ea.

25K 20 Turn Trim Pot	$1.00
1K 20 Turn Trim Pot	$ .50

Trimmer Caps

Sprague - 3-40 pf
Stable Polypropylene
.50 ea.

Crystal Microphone

Small 1" diameter ¼" thick crystal mike cartridge **$.75**

Mini RG-174 Coax
10 ft. for $1.00

Coax Connector

Chassis mount
BNC type **$1.00**

9 Volt Battery Clips

Nice quality clips	5 for $1.00
¼" Rubber Grommets	10 for $1.00

Parts Bag

Asst. of chokes, disc caps, tant., resistors, transistors, diodes, MICA caps etc.
sm. bag (100 pc) **$1.00** lg. bag (300 pc) **$2.50**

Connectors

6 pin type gold contacts for mA-1003 car clock module price **.75 ea.**

Leds - your choice, please specify

Mini Red, Jumbo Red, High Intensity Red, Illuminator Red	8/$1
Mini Yellow, Jumbo Yellow, Jumbo Green	6/$1

Varactors

Motorola MV 2209 30 PF Nominal cap 20-80 PF - Tunable range -
.50 each or 3/$1.00

CLOCK KITS

Your old favorites are here again. Over 7,000 Sold to Date. Be one of the gang and order yours today!

Try your hand at building the finest looking clock on the market. Its satin finish anodized aluminum case looks great anywhere, while six .4" LED digits provide a highly readable display. This is a complete kit, no extras needed, and it only takes 1-2 hours to assemble. Your choice of case colors: silver, gold, black (specify).

Clock kit, 12/24 hour, DC-5	$24.95
Clock with 10 min. ID timer, 12/24 hour, DC-10	$29.95
Alarm clock, 12 hour only, DC-8	$29.95
12V DC car clock, DC-7	$29.95

For wired and tested clocks add $10.00 to kit price.
SPECIFY 12 OR 24 HOUR FORMAT

Car Clock

The UN-KIT, only 5 solder connections

Here's a super looking, rugged and accurate auto clock, which is a snap to build and install. Clock movement is completely assembled — you only solder 3 wires and 2 switches, takes about 15 minutes! Display is bright green with automatic brightness control photocell — assures you of a highly readable display, day or night. Comes in a satin finish anodized aluminum case which can be attached 5 different ways using 2 sided tape. Choice of silver, black or gold case (specify).

DC-3 kit, 12 hour format	$22.95
DC-3 wired and tested	$29.95

Calendar Alarm Clock

The clock that's got it all: 6-.5" LEDs, 12/24 hour, snooze, 24 hour alarm, 4 year calendar, battery backup, and lots more. The super 7001 chip is used. Size 5x4x2 inches. Complete kit, less case (not available)
DC-9 **$34.95**

Under Dash Car Clock

12/24 hour clock in a beautiful plastic case features 6 jumbo RED LEDS, high accuracy (.001%), easy 3 wire hookup, display blanks with ignition and super instructions. Optional dimmer atuomatically adjusts display to ambient light level.

DC-11 clock with mtg. bracket	$27.95 kit
DM-1 dimmer adapter	$2.50

Add $10.00 Assy. and Test

Video Terminal

A completely self-contained, stand alone video terminal card. Requires only an ASCII keyboard and TV set to become a complete terminal unit. Features are: single 5V supply, XTAL controlled sync and baud rates (to 9600), complete computer and keyboard control of cursor. Parity error control and display. Accepts and generates serial ASCII plus parallel keyboard input. The 6416 is 64 char. by 16 lines with scrolling, upper and lower case (optional) and has RS-232 and 20ma loop interfaces on board. Kits include sockets and complete documentation.

RE 6416 terminal card kit (add $80.00 for wired unit)	$169.95
Lower Case option	$12.95
Power Supply	$14.95
RF Modulator kit	$7.95

Audio Prescaler

Make high resolution audio measurments, great for musical instrument tuning, PL tones, etc. Multiplies audio UP in frequency, selectable x10 or x100, gives .01 HZ resolution with 1 sec. gate time! High sensitivity of 25 mv, 1 meg input z and built-in filtering gives great performance. Runs on 9V battery, all CMOS.

PS-2 kit	$29.95
PS-2 wired	$39.95

600 MHz PRESCALER

Extend the range of your counter to 600 MHz. Works with all counters. Less than 150 mv sensitivity, specify -10 or -100

Wired, tested, PS-1B	$59.95
Kit, PS-1B	$44.95

30 Watt 2 mtr PWR AMP

Simple Class C power amp features 8 times power gain. 1 W in for 8 out, 2 W in for 15 out, 4W in for 30 out. Max output of 35 W, incredible value, complete with all parts, less case and T-R relay.

PA-1, 30 W pwr amp kit	$22.95
TR-1, RF sensed T-R relay kit	6.95

MRF-238 transistor as used in PA-1
8-10db gain 150 mhz **$11.95**

RF actuated relay senses RF (1W) and closes DPDT relay. For RF sensed T-R relay
TR-1 Kit **$6.95**

Power Supply Kit

Complete triple regulated power supply provides variable 6 to 18 volts at 200 ma and +5 at 1 Amp. Excellent load regulation, good filtering and small size. Less transformers, requires 6.3 V @ 1 A and 24 VCT.
Complete kit, PS-3LT **$6.95**

OP-AMP Special

BI-FET LF 13741 - Direct pin for pin 741 compatible, but 500,000 MEG input z, super low 50 pa input current, low power drain

50 for only $9.00 **10 for $2.00**

Regulators

78MG	$1.25	7812	$1.00
79MG	$1.25	7815	$1.00
723	$.50	7905	$1.25
309K	$1.15	7912	$1.25
7805	$1.00	7915	$1.25

Shrink Tubing Nubs

Nice precut pces of shrink size 1" x ⅛" shrink to ⅛". Great for splices **50/$1.00**

Mini TO-92 Heat Sinks

Thermalloy Brand	5 for $1.00
To-220 Heat Sinks	3 for $1.00

Opto Isolators - 4N28 type	$.50 ea.
Opto Reflectors - Photo diode + LED	$1.00 ea.

Molex Pins

Molex already precut in length of 7. Perfect for 14 pin sockets. **20 strips for $1.00**

CDS Photocells

Resistance varies with light. 250 ohms to over 3 meg **3 for $1.00**

✓See List of Advertisers on page 130

COMMUNICATIONS CENTER

CALL TOLL FREE

1-800-228-4097

E.T.O. ● KENWOOD ● YAESU ● ICOM ● DRAKE ● EPSON ● HY-GAIN ● ATARI ● SONY ● PANASONIC ● TEMPO ● MIRAGE

HUSTLER ● TELEX ● CUSHCRAFT ● DAIWA ● BENCHER ● TRAC ● J.I.L. ● C.D.E. ● KANTRONICS ● AVANTI ● CENTURION

Kenwood R-600 Receiver

KENWOOD
R-600

Call for super introductory price!

- **-Power Switch**
- **-"S" Meter** indicates strength of received signals.
- **-Digital Display** indicates frequency of received signal.
- **-Mode Switch** selects operating modes: AM (wide) for broadband AM reception such as from AM broadcast band. AM (narrow) for AM voice reception, with maximum rejection of interfering signals USB for SSB (USB) reception LSB/CW for SSB (LSB) or CW reception.
- **-Band switch** selects frequency band in MHz, from 0 to 29 in 1 MHz steps.
- **-Main Tuning Knob** Use to select frequency within each band.
- **-RF ATT Switch** allows 20 dB input signal attenuation.
- **-Tone Control** allows adjustment of audio frequency response to minimize effect of interference.
- **-NB Switch** noise blanker, minimizes effect of ignition and other pulse-type interference.
- **-AF Gain Control** allows adjustment of speaker output volume.
- **-Speaker**
- **-RECORD Jack** permits use of tape recorder to record signals being received.
- **-PHONES Jack** allows use of headphones for private listening.

SPECIAL $159.95

DAIWA CN-720 SWR & POWER METER

The cross-needle meter indicates both forward power and reflected power on one meter and SWR is read directly at the point where the needles intersect. Both power and SWR can be checked instantly without time-consuming sensitivity adjustments—even when using SSB.

MIRAGE B-108 Two Meter Amplifier

Features: 10W in—80W out or 2 Watts in 50 Watts output for Handie-Talkies. Built-in Receive Preamp. Adjustable Delay for SSB. Automatic Internal or External Relay Switching. Frequency Range 144 to 148 MHz. Works for SSB, CW or FM Modes. Receive Preamp Provides 10db Gain Min., 5 YEAR WARRANTY

*NAV $179.95

OUR PRICE $159.95

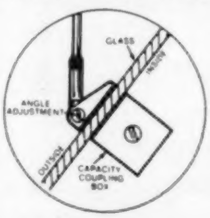
"Our Most Popular Scanner the JIL SX-100"

16 Channels: 30-54 MHz; 140-180 MHz; 410-514 MHz. Digital Clock. Date Display. 110 V. AC or 12-16 V. DC.
Seek Rate: Fast 10ch/sec
Slow 5ch/sec
Bright Green 9 Digit Frequency Display. Ext. Antenna Jack. Ext. Speaker Jack. Large Top Mounting Bracket. Scan Rate: Fast 8ch/sec. Slow 4ch/sec
Scan Delay Time Variable 0-4 sec.

*NAV $399.00

UNBELIEVABLY PRICED AT A LOW $199.95

2 Meter Avanti Mobile Antenna



Mounts on glass — no holes! Receives and transmits through glass. Superior performance. Superior radiation, true Omni-Directional pattern. Mounting on glass is easy and effective using new Duo-Bond method which combines quick "drive away" with rugged durability. No holes to drill, no magnet to scratch paint, no clamps. Takes only minutes to install, without tools. No ground plane required. Electrical connections are inside and out of sight to prevent crimping or corroding coaxial cable.

SPECIAL $29.95

Call for Discount Prices.

Computer

AMDEK
APPLE
ATARI
BASE 2
CENTRONICS
COMMODORE
DC HAYES
HAZELTINE
LEEDEX
MACROTRONICS
MAXELL
MICROSOFT
MOUNTAIN HARDWARE
N E C
NORTHSTAR
PANASONIC
SANYO
SYNCOM

Amateur Radio

AVANTI
BASH BOOKS
BEARCAT
BENCHER
CALL BOOK
CUSHCRAFT
DAIWA
DENTRON
DRAKE
ETO
HUSTLER
HY-GAIN
ICOM
KANTRONICS
KENWOOD
MIRAGE
PANASONIC
SHURE
TEMPO
TELEX
TRAC
YAESU

CENTURION
ANTENNAS

PRICES SUBJECT TO CHANGE AND AVAILABILITY WE TRADE WE EXPORT

YOUR ELECTRONICS CENTER

1840 "O" Street Lincoln, Nebraska 68508 ✓28
In Nebraska Call (402) 476-7331

*Nationally Advertised Value

master charge

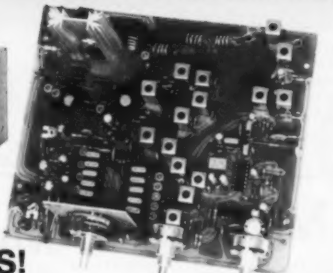
VISA

- FM • SSB • CW • ATV • OSCAR
- LINKS • REPEATERS • TRANSMITTERS
- RECEIVERS • PREAMPS • CONVERTERS
- TRANSCEIVERS • POWER SUPPLIES • PA'S

QUALITY VHF/UHF KITS AT AFFORDABLE PRICES

-NEW-

hamtronics
FM-5 TRANSCEIVER
CHANNEL
SQUELCH
VOLUME



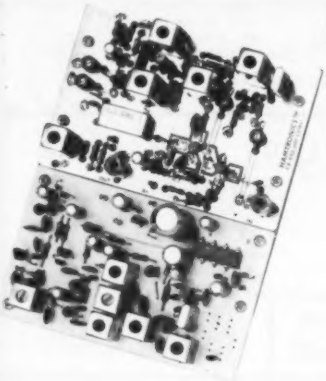
FM-5 PC Board Kit – **ONLY $159.95** complete with controls, heatsink, etc.

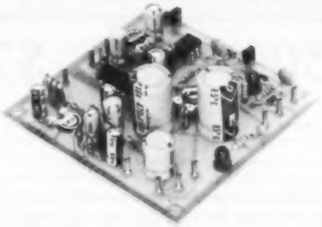
★ **SPECIAL OFFER** Free cabinet kit, complete with speaker, knobs, connectors, hardware. A $59.95 value, yours free with purchase of kit. Hurry! Offer limited. ★

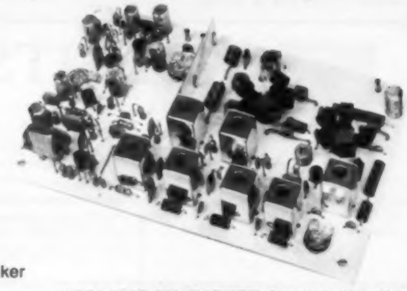
SAVE A BUNDLE ON VHF FM TRANSCEIVERS!

10 watts, 5 Channels, for 6M, 2M, or 220

HIGH QUALITY FM MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.







- **R76 VHF FM RECEIVER** for 10M, 6M, 2M, 220, or commercial bands. Fantastic selectivity options. Kits from $84.95 to $109.95
- **R450 UHF FM RECEIVER** for 380-520 MHz bands. Kits in selectivity options from $94.95
- **R110 VHF AM RECEIVER** Kit for vhf aircraft band or ham bands. Only $84.95.
- **COR KITS** With audio mixer and speaker amplifier. Only $29.95.
- **CWID KITS** 158 bits, field programmable, clean audio. Only $59.95.
- **A16 RF TIGHT BOX** Deep drawn alum. case with tight cover and no seams. 7 x 8 x 2 inches. Only $18.00.
- **SCANNER CONVERTERS** Copy 72-76, 135-144, 240-270, 400-420, or 806-894 MHz bands on any scanner. Wired/tested Only $79.95.
- **T51 VHF FM EXCITER** for 10M, 6M, 2M, 220 MHz or adjacent bands. 2 Watts continuous. Kits only $54.95.
- **T451 UHF FM EXCITER** 2 to 3 Watts on 450 ham band or adjacent. Kits only $64.95.
- **VHF & UHF LINEAR AMPLIFIERS.** Use on either FM or SSB. Power levels from 10 to 45 Watts to go with exciters & xmtg converters. Kits from $69.95.

hamtronics
TRANSMITTING CONVERTER
PWR
RF IN
RF OUT

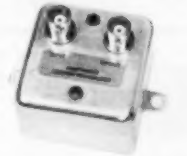
VHF & UHF TRANSMITTING CONVERTERS

For SSB, CW, ATV, FM, etc. Available for 6M, 2M, 220, 440 with many IF input ranges. Converter board kit only at $79.95 (VHF) or $99.95 (UHF) or kits complete with PA and cabinet as shown.

hamtronics
RECEIVING CONVERTER
RCVR
PWR
ANT

VHF & UHF RECEIVING CONVERTERS

20 Models cover every practical rf and if range to listen to SSB, FM, ATV, etc. on 6M, 2M, 220, 440, and 110 aircraft band. Even convert weather down to 2M! Kits from $39.95 and wired units.



VHF & UHF RECEIVER PREAMPS. Low noise.

VHF Kits from 27 to 300 MHz. UHF Kits from 300 to 650 MHz. Broadband Kits: 20-650 MHz. Prices start at $14.95 (VHF) and $18.95 (UHF). All preamps and converters have noise figure 2dB or less.

- Call or Write for FREE CATALOG
(Send $1.00 or 4 IRC's for overseas MAILING)
- Order by phone or mail ● Add $2 S & H per order
(Electronic answering service evenings & weekends)
Use VISA, MASTERCARD, Check, or UPS COD.

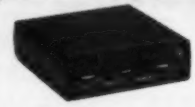
hamtronics, inc.

65-R MOUL RD. • HILTON NY 14468
Phone: 716-392-9430

✓ 33

Hamtronics® is a registered trademark

ramsey the first name in Counters !



9 DIGITS 600 MHz $129.95 WIRED

PRICES

CT-90 wired, 1 year warranty	$129.95
CT-90 Kit, 90 day parts warranty	109.95
AC-1 AC adapter	3.95
BP-1 Nicad pack + AC Adapter Charger	12.95
OV-1, Micro-power Oven time base	49.95
External time base input	14.95

The CT-90 is the most versatile, feature packed counter available for less than $300.00! Advanced design features include; three selectable gate times, nine digits, gate indicator and a unique display hold function which holds the displayed count after the input signal is removed! Also, a 10mHz TCXO time base is used which enables easy zero beat calibration checks against WWV. Optionally; an internal nicad battery pack, external time base input and Micro-power high stability crystal oven time base are available. The CT-90, performance you can count on!

SPECIFICATIONS:

Range:	20 Hz to 600 MHz
Sensitivity:	Less than 10 MV to 150 MHz Less than 50 MV to 500 MHz
Resolution:	0.1 Hz (10 MHz range) 1.0 Hz (60 MHz range) 10.0 Hz (600 MHz range)
Display:	9 digits 0.4" LED
Time base:	Standard-10.000 mHz, 1.0 ppm 20-40°C. Optional Micro-power oven-0.1 ppm 20-40°C
Power:	8-15 VAC @ 250 ma

7 DIGITS 525 MHz $99.95 WIRED

SPECIFICATIONS:

Range:	20 Hz to 525 MHz
Sensitivity:	Less than 50 MV to 150 MHz Less than 150 MV to 500 MHz
Resolution:	1.0 Hz (5 MHz range) 10.0 Hz (50 MHz range) 100.0 Hz (500 MHz range)
Display:	7 digits 0.4" LED
Time base:	1.0 ppm TCXO 20-40°C
Power:	12 VAC @ 250 ma

The CT-70 breaks the price barrier on lab quality frequency counters. Deluxe features such as; three frequency ranges - each with pre-amplification, dual selectable gate times, and gate activity indication make measurements a snap. The wide frequency range enables you to accurately measure signals from audio thru UHF with 1.0 ppm accuracy - that's .0001%! The CT-70 is the answer to all your measurement needs, in the field, lab or ham shack.

PRICES:

CT-70 wired, 1 year warranty	$99.95
CT-70 Kit, 90 day parts warranty	84.95
AC-1 AC adapter	3.95
BP-1 Nicad pack + AC adapter/charger	12.95

7 DIGITS 500 MHz $79.95 WIRED

PRICES:

MINI-100 wired, 1 year warranty	$79.95
AC-Z Ac adapter for MINI-100	3.95
BP-Z Nicad pack and AC adapter/charger	12.95

Here's a handy, general purpose counter that provides most counter functions at an unbelievable price. The MINI-100 doesn't have the full frequency range or input impedance qualities found in higher price units, but for basic RF signal measurements, it can't be beat! Accurate measurements can be made from 1 MHz all the way up to 500 MHz with excellent sensitivity throughout the range, and the two gate times let you select the resolution desired. Add the nicad pack option and the MINI-100 makes an ideal addition to your tool box for "in-the-field" frequency checks and repairs.

SPECIFICATIONS:

Range:	1 MHz to 500 MHz
Sensitivity:	Less than 25 MV
Resolution:	100 Hz (slow gate) 1.0 KHz (fast gate)
Display:	7 digits, 0.4" LED
Time base:	2.0 ppm 20-40°C
Power:	5 VDC @ 200 ma

8 DIGITS 600 MHz $159.95 WIRED

NEW
READ
RECEIVER
FREQUENCY

SPECIFICATIONS:

Range:	20 Hz to 600 MHz
Sensitivity:	Less than 25 mv to 150 MHz Less than 150 mv to 600 MHz
Resolution:	1.0 Hz (60 MHz range) 10.0 Hz (600 MHz range)
Display:	8 digits 0.4" LED
Time base:	2.0 ppm 20-40°C
Power:	110 VAC or 12 VDC

The CT-50 is a versatile lab bench counter that will measure up to 600 MHz with 8 digit precision. And, one of its best features is the Receive Frequency Adapter, which turns the CT-50 into a digital readout for any receiver. The adapter is easily programmed for any receiver and a simple connection to the receiver's VFO is all that is required for use. Adding the receiver adapter in no way limits the operation of the CT-50, the adapter can be conveniently switched on or off. The CT-50, a counter that can work double-duty!

PRICES:

CT-50 wired, 1 year warranty	$159.95
CT-50 Kit, 90 day parts warranty	119.95
RA-1, receiver adapter kit	14.95
RA-1 wired and pre-programmed (send copy of receiver schematic)	29.95

DIGITAL MULTIMETER $99.95 WIRED

PRICES:

DM-700 wired, 1 year warranty	$99.95
DM-700 Kit, 90 day parts warranty	79.95
AC-1, AC adaptor	3.95
BP-3, Nicad pack +AC adapter/charger	19.95
MP-1, Probe kit	2.95

The DM-700 offers professional quality performance at a hobbyist price. Features include; 26 different ranges and 5 functions, all arranged in a convenient, easy to use format. Measurements are displayed on a large 3½ digit, ½ inch LED readout with automatic decimal placement, automatic polarity, overrange indication and overload protection up to 1250 volts on all ranges, making it virtually goof-proof! The DM-700 looks great, a handsome, jet black, rugged ABS case with convenient retractable tilt bail makes it an ideal addition to any shop.

SPECIFICATIONS:

DC/AC volts:	100uV to 1 KV, 5 ranges
DC/AC current:	0.1uA to 2.0 Amps, 5 ranges
Resistance:	0.1 ohms to 20 Megohms, 6 ranges
Input impedance:	10 Megohms, DC/AC volts
Accuracy:	0.1% basic DC volts
Power:	4 'C' cells

AUDIO SCALER

For high resolution audio measurements, multiplies UP in frequency.

- Great for PL tones
- Multiplies by 10 or 100
- 0.01 Hz resolution!

$29.95 Kit $39.95 Wired

ACCESSORIES

Telescopic whip antenna - BNC plug	$ 7.95
High impedance probe, light loading	15.95
Low pass probe, for audio measurements	15.95
Direct probe, general purpose usage	12.95
Tilt bail, for CT 70, 90, MINI-100	3.95
Color burst calibration unit, calibrates counter against color TV signal	14.95

COUNTER PREAMP

For measuring extremely weak signals from 10 to 1,000 MHz. Small size, powered by plug transformer-included.

- Flat 25 db gain
- BNC Connectors
- Great for sniffing RF with pick-up loop

$34.95 Kit $44.95 Wired

ramsey electronic's, inc. VISA master charge
2575 Baird Rd. Penfield, NY 14526
62

PHONE ORDERS
CALL 716-586-3950

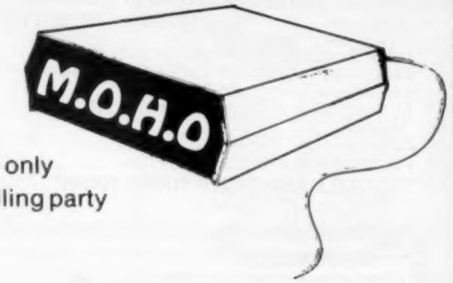
TERMS Satisfaction guaranteed: examine for 10 days, if not pleased, return in original form for refund. Add 5% for shipping, insurance to a maximum of $10. Overseas add 15%. COD add $2. Orders under $10, add $1.50. NY residents add 7% tax.

DIGITAL RESEARCH: PARTS

"TOP QUALITY PARTS FOR LESS"

THE M.O.H.O.

(Sensational New Hold Device For Your Phone)



A Digital Research Exclusive. This handy item allows your home phone the **HOLD** option, formerly available only to the businessman. Enjoy the convenience of placing calling party on hold without monthly charges!

- Activates using the "★" button on your phone.
- Pleasant "Tone" to remind caller he is on hold.
- Unique 4 minute cutoff if calling party is forgotten.
- Can be used to provide music for the calling party.
- FCC Approved.

MOHO is accessible from any phone in your home.

$37.50
Assembled & Tested

Kit $29.95 Complete
(For rotary dial add $1.50 per phone)

POWER SUPPLY TRIPLE OUTPUT

25 Volts @ .18A
5 Volts @ .8A
15 Volts @ 1.25A
Isolated independent outputs
Positive or negative operation
Constant Voltage Regulation
25 Volt line adjustable with 10 turn pot from 23.5 V to 28 Volts. 120 Volt - 60 Hz input Fused - H=3¾" W=5½" D=4"

$^{\$}14^{95}$

SOCKETS

Low Profile Solder Tail

8 pin	15/1.00	20 pin	7/1.00
14 pin	10/1.00	24 pin	6/1.00
16 pin	8/1.00	28 pin	6/1.00
18 pin	8/1.00	40 pin	5/1.00

Buy $10 Get $1.00 FREE CHOICE

Precision Hybrid Oscillator Module

Has both 1 MHZ and 2 MHZ TTL - outputs —Hermetically sealed —Ultra high stability over wide temp. range —originally cost over $40.00 each — we made a super purchase from a major computer manufacturer — 5 Volt operation - fits standard 24 pin socket - Manufactured by Motorola oscillator division.

MC6871A
CRYSTAL OSC
1.0 MHz
MOTOROLA

MC6871A

$3/20^{00}$

7^{50} w/data

Variable Inductors

30-40 uh
.9 uh - 1.2 uh
11 uh to 20 uh
.25 uh - .35 uh
.85 uh - .95 uh

$4/1^{00}$

NEO 2137 by NEC

- Microwave R.F. transistor (N.P.N.)
- Micromold Package #37
- Dual Emitter leads
- FT to 4.5 GHZ
- VCEO 10V-CC 20 MA. HFE 40-200
- Gain 10V-20MA-1GHZ = 14DB Typical
- Very low noise - High gain 1.5 DB @500 MHZ
- Cleared for high reliability space applications

COMPARE 1^{50}

EIAJ #1SS98

NEC #4981-7E
Microwave - Schottky barrier diode

HP-Hot Carrier diodes
5082-2835

99¢ or $6/5^{00}$

2N6058

12 AMP Darlington NPN
VCEO - 80 VDC
IC - 12 ADC
HFE-3500 (Typ.) @ 5.0ADC
TO-3 Case

1.35 ea. 3/3.50

UNIVERSAL TIMER KIT

- ★ **Adjustable from 1 sec to 1 hr.**
- ★ **Control up to 1 amp**

"Turn Things On Or Off"

Kit includes all parts necessary to build this exciting kit. Uses: Children's T.V. programs - Darkroom exposures - Amateur 10 min. I.D.er - Egg Timer - Intermittent Windshield Wiper. Absolutely endless uses. Complete kit including power supply, p.c. board DPDT relay, and all parts to make timer operational.

$^{\$}8^{95}$

ORDER YOUR FREE 1982 CATALOG TODAY!

TERMS: Add $1 postage, we pay balance. Orders under $15 add 75¢ handling. No C.O.D. We accept Visa, MasterCard and American Express cards. Tex. Res. add 5% Tax. Foreign orders (Canada 10%) add 20% P & H.

• VISA • MASTERCARD • AMERICAN EXPRESS •

Digital Research: Parts
P.O. Box 401247 • Garland, Texas 75040
(214) 271-2461

ANTENNA SPECIALISTS · AVANTI · ARRL PUBS · AMECO · BASH · BEARCAT · BENCHER · B&W · BIRD · CALLBOOK · COMMUNICATIONS SPECIALISTS · CUSHCRAFT · DRAKE · HAM KEY · HUSTLER · HY-GAIN · ICOM · KANTRONICS ■ LARSEN · MFJ · MORGAIN · PANASONIC · RAMSEY · SHURE · SONY · TELEX · TEN TEC · TRAC · TRANSCOM · VAN GORDON · VOCOM

SONY ICF2001

DIGITAL DIRECT ACCESS SHORT WAVE RECEIVER

- 150KHz -30 MHz + FM BROADCAST
- PLL SYNTHESIZED WITH SCANNING & MEMORY
- AC ADAPTOR INCLUDED
- 1 YEAR SONY U.S.A. FACTORY LIMITED WARRANTY
- AM/CW/SSB
- SURPRISINGLY AFFORDABLE

CALL AND ORDER YOURS TODAY

OUR BEST-SELLING MULTI-BAND!

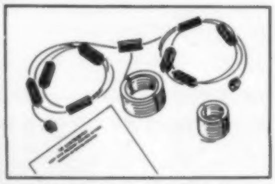
MORGAIN

AS LOW AS **$94.50**

Add $5.00 for shipping (Cont'l U.S.A.)

- One half the length of conventional half-wave dipoles
- Multi-band, Multi-frequency.
- Maximum efficiency — no traps, loading coils, or stubs.
- Fully assembled and pre-tuned — no measuring, no cutting.
- All weather rated — 1 KW AM, 2.5 KW CW or PEP SSB.
- Proven performance — more than 10,000 have been delivered.
- Permit use of the full capabilities of today's 5-band xcvrs.
- One feedline for operation on all bands.

80-40HD/A	80/40 Mtr bands (69)	**99.00**
75/40HD/A	75/40 Mtr bands (66)	**94.50**
75-10HD/A	75/40/20/15/10 Mtr (66)	**126.95**
80-10HD/A	80/40/20/15/10 Mtr (69)	**132.00**



Eavesdropper

SHORT WAVE BROADCAST RECEIVING ANTENNA

- AUTOMATIC BANDSWITCHING!
- COMPLETELY WEATHERPROOF!
- COMPLETE, NO ASSEMBLY NEEDED!
- 60, 49, 41, 31, 25, 19, 16, 13 & 11M BANDS!

$59.95 plus $3.00 shipping (Cont'l U.S.)

All the world's shortwave broadcast bands are yours with the Eavesdropper All-Band antenna. Individually tuned traps make the Eavesdropper work like seven separate antennas, each tuned to a different international broadcast band. Also covers 11, and 60M bands as well. Its 100 foot, 72 ohm balanced feedline provides an exact match to the antenna on every band. Comes completely assembled, and ready to install with 50 ft. of 450 lb. test nylon rope. Overall length: 42'10". Wire: #14 copper clad steel. Bandswitching: Automatic. Impedance to rcvr: 50-75 ohms balanced.

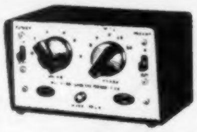
Only$59.95

AMECO ALL-BAND PREAMP!

Our Most Popular Preamplifier

MODEL PLF-2

$52.95 plus $3.00 shipping



MODEL PLF-2...Improves weak signals as much as image and spurious rejection of most receivers. Direct switching to rec. or preamp. Includes pwr. supp. 117 VAC wired & tested. **$52.95**

MODEL PLF-2E...240 VAC 50-60 Hz operation. **$57.95**

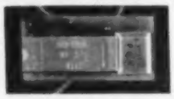
MODEL PT-2...For transceiver use. Continuously tunable from 6 to 160 meters. Features dual-gate FET transistor amplifier for improved receiver sensitivity and low noise figure. Requires no transceiver modifications and can handle up to 250W transceiver output, 117 VAC 60 Hz. . . . **$79.95**

MODEL PT-2E...240 VAC 50-60 Hz operation **$84.95**

TRANSCOM

PROGRAMMABLE SUB AUDIBLE TONE ENCODER FOR ICOM HANDHELDS.

NEW!



$29.95 Plus $2.00 shipping and handling

- ONLY 1.1" X 55" X .2"
- PRESET OUTPUT LEVEL FOR IC2A
- LOW TONE DISTORTION LESS THAN 1% THD
- TONE STABILITY ± .2% Hz FROM -20C TO +70C
- 1 YEAR LIMITED FACTORY WARRANTY
- 5VDC POWERED

ICOM

WE'VE SOLD FM GEAR FOR 14 YEARS & IN OUR OPINION ICOM IS... "SIMPLY THE BEST"

IC2A, IC2AT

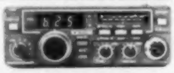
OUR MOST POPULAR HAND HELD & THE BEST VALUE AVAILABLE

- COMPACT
- QUALITY CONSTRUCTION
- VERSATILE
- AFFORDABLE
- WIDE RANGE OF ACCESSORIES AVAILABLE

NEW!

IC3AT (220 MHz)
IC4AT (440 MHz)

IC25A



A LITTLE PACKAGE WITH A LOT OF BIG FEATURES...

- 25W OUTPUT
- MEMORIES
- ENCODING MIC
- SCANNING

CALL FOR PRICE & AVAILABILITY

TO ORDER: CALL OR WRITE. MASTER CARD, VISA, MONEY ORDERS, PERSONAL CHECKS TAKE 3 WEEKS TO CLEAR, ACCEPTED. **INTERNATIONAL ORDERS WELCOME,** PLEASE REQUEST PRO FORMA INVOICE.

HOURS: MON. THRU WED. 9:30-6:00, THURS-FRI. 9:30-8:00, SAT. 9:30-3:00

STOP BY AND VISIT WHEN IN THE CHICAGOLAND AREA!!

SPECTRONICS, INC.

1009 GARFIELD ST. OAK PARK, IL. 60304

PHONE
(312)848-6777

UTIC

MINI STEREO FM RECEIVER

WITH HEADPHONES

For Joggers, Cyclists, and Skaters!

FEATURES: Lightweight headphones. Left/right balance control. Full fidelity stereo sound. Additional black soft carrying case & shoulder strap. Belt clip (hands free). Operates on 3 AA cell batteries (not incl.). Compact size: 3⅛" x 4⅞" x 1". Wt. 6 oz.

Model 1810 List Price $89.95 .... **$29.95**

SPEAKERS

Part# A0201	1	2-9
	1.25	.99

2¼" Round — 8 Ohm
.25 Watt (4" Leads)
Size: 2¼" x ⅝"

Part# SF-25016	1	2-9
	1.39	1.25

2½" Square — 16 Ohm
.25 Watt (4 mount. holes)
Large Ceramic Magnet
Size: 2⅝" x 2⅝" x ⅞"

National Semiconductor

RAM SALE

STATIC RAMS

MM2114N-2 4K (200NS) .... **$2.49 each**
(8 EACH $16.95/lot) (100 EACH $195.95/lot)

MM2114N-2L 4K (200NS) Low Power .... **$2.95 each**
(8 EACH $19.95/lot) (100 EACH $225.00/lot)

MM2147N 4K (70NS) .... **$4.95 each**
(8 EACH $34.95/lot) (100 EACH $419.95/lot)

MM6116P-4 16K (200NS) .... **$14.95 each**
(8 EACH $99.95/lot) (100 EACH $1196.00/lot)

DYNAMIC RAMS

MM4164N-20 64K (200NS) .... **$14.95 each**
(8 EACH $99.95/lot) (100 EACH $1196.00/lot)

MM5290N-2 16K (150NS) 4116 .... **$2.95 each**
(8 EACH $19.55/lot) (100 EACH $225.00/lot)

MM5290N-4 16K (250NS) 4116 .... **$1.95 each**
(8 EACH $14.95/lot) (100 each $175.00/lot)

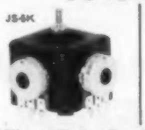
EPROM Erasing Lamp

- Erases 2708, 2716, 1702A, 5203Q, 5204Q, etc.
- Erases up to 4 chips within 20 minutes.
- Maintains constant exposure distance of one inch.
- Special conductive foam liner eliminates static build-up.
- Built-in safety lock to prevent UV exposure.
- Compact — only 7-5/8" x 2-7/8" x 2"
- Complete with holding tray for 4 chips.

UVS-11EL Replacement Bulb $16.95

UVS-11E $79.95

JOYSTICKS

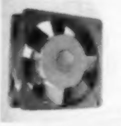


JS-6K

JVC-40

JS-6K	**5K Linear Taper Pots**	**$5.25**
JS-100K	**100K Linear Taper Pots**	**$4.95**
JVC-40	**40K (2) Video Controller in case**	**$4.95**

MUFFIN® FAN



The dependable, low cost, largest selling fan for commercial cooling applications.

- 105cfm free air delivery
- 4.68" sq. x 1.50" depth. Weight - 17 oz.
- acoustical rating as low as NC-38
- more than 10 yrs. cont. duty at 10°C
- impedance protected
- for ambients to 70°C
- UL yellow card recognized & CSA approved

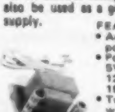
115V, 50/60Hz, 14 Watts, 105cfm — Ultrasonically cleaned & tested.

MU2A1 .... $9.95 ea.

NEW!

JE215 Adjustable Dual Power Supply

General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general all-purpose variable power supply.



FEATURES:

- Adjustable regulated power supplies, pos. and neg. 1.2VDC to 15VDC.
- Power Output (each supply): 5VDC @ 500mA, 10VDC @ 750mA, 12VDC @ 500mA, and 15VDC @ 175mA.
- Two, 3-terminal adj. IC regulators with thermal overload protection.
- Heat sink regulator cooling
- LED "on" indicator
- Printed Board Construction
- 120VAC input
- Size: 3-1/2"w x 5-1/16"L x 2"H

JE215 Adj. Dual Power Supply Kit (as shown) . . $24.95

(Picture not shown but similar in construction to above)

JE200 Reg. Power Supply Kit (5VDC, 1 amp) . . $14.95
JE205 Adapter Brd. (to JE200) ±5, ±9 & ±12V. $12.95
JE210 Var. Pwr. Sply. Kit, 5-15VDC, to 1.5amp. $19.95

MICROPROCESSOR COMPONENTS

8080A/8085A SUPPORT DEVICES

INS8080A	CPU	4.95
DP8212	8-Bit Input/Output	3.25
DP8214	Priority Interrupt Control	5.95
DP8216	Bi-Directional Bus Driver	3.49
DP8224	Clock Generator/Driver	3.95
DP8226	Bus Driver	3.49
DP8228	System Controller/Bus Driver	4.95
DP8238	System Controller	5.95
INS8243	I/O Expander for 48 Series	9.95
INS8250	Asynchronous Comm. Element	16.95
DP8251	Prog. Comm. I/O (USART)	6.95
DP8253	Prog. Interval Timer	8.95
DP8255	Prog. Peripheral I/O (PPI)	5.95
DP8257	Prog. DMA Control	9.95
DP8259	Prog. Interrupt Control	9.95
DP8275	Prog. CRT Controller	29.95
DP8279	Prog. Keyboard/Display Interface	9.95
DP8284	System Timing Element	6.95
DP8304	8-Bit Bi-Directional Receiver	3.95
DP8307	8-Bit Bi-Directional Receiver	3.95
DP8308	8-Bit Bi-Directional Receiver	3.95
DP8310	Octal Latched Peripheral Driver	5.35
DP8311	Octal Latched Peripheral Driver	5.25

6800/6800 SUPPORT DEVICES

MC6800	MPU	7.95
MC6802CP	MPU with Clock and RAM	10.95
MC6810AP1	128x8 Static RAM	4.95
MC6821	Peripheral Inter. Adapt (MC6820)	7.49
MC6828	Priority Interrupt Controller	17.95
MC6830L8	1024x8-Bit ROM (MC68A30-8)	14.95
MC6850	Asynchronous Comm. Adapter	6.95
MC6852	Synchronous Serial Data Adapter	6.95
MC6860	0-600bps Digital MODEM	10.95
MC6862	2400bps Modulator	12.95
MC6880A	Quad 3-State Bus. Trans. (MC8T26)	2.25

MICROPROCESSOR CHIPS

Z80 (780C)	CPU (MK3880N) (2MHz)	11.95
Z80A (780-1)	CPU (MK3880N-4) (4MHz)	13.95
CDP1802	CPU	19.95
2650	MPU	19.95
IDM2901ADC	CPU—4-Bit Slice (Com. Temp. Grade)	19.95
MC3870	MPU w/Clock (2K Bytes Memory)	11.95
INS8035N-6	MPU—8-Bit (6MHz)	7.95
INS8039N-6	CPU—Sgl. Chip 8-Bit (128 bytes RAM)	9.95
INS8040N-6	CPU (256 Bytes RAM)	24.95
INS8070N	CPU—64 Bytes RAM	24.95
INS8073N	CPU w/Basic Micro Interpreter	29.95
8085	CPU	9.95
TMS9900JL	MPU—16-Bit	39.95
1173AN-1	30 Tone Musical MPU Chip	8.95

SHIFT REGISTERS

MM500H	Dual 25-Bit Dynamic	.50
MM503H	Dual 50-Bit Dynamic	.50
MM506H	Dual 100-Bit Static	.50
MM5016H	Dual 64-Bit Accumulator	.50
MM1403N	256-Bit Dynamic	1.95
MM5013N	1024-Bit Dynamic/Accumulator	1.95
MM5016H	500/512-Bit Dynamic	1.95
MM5058N	Octal 80-Bit	9.50
MM5059N	Octal 80-Bit	9.50
2504V (1404A)	1024-Bit Dynamic	1.95
2518N	Hex 32-Bit Static	3.95
2522V	Dual 132-Bit Static	2.95
2524V	512-Bit Dynamic	.99
2525V	1024-Bit Dynamic	2.95
2527V	Dual 256-Bit Static	2.95
2528V	Dual 250-Bit Static	4.00
2529V	Dual 240-Bit Static	4.00
2532N	Quad 80-Bit Static	2.95
3341PC	Fifo (Dual 64)	6.95

DATA ACQUISITION

AF100-1CN	Universal Active Filter 2.5%	6.95
AF121-1CJ	Touch Tone Low Band Filter	19.95
AF122-1CJ	Touch Tone High Band Filter	19.95
LM308CH	Super Gain Op Amp	1.35
LM334Z	Constant Current Source	1.39
LM335Z	Temperature Transducer	1.40
LF356N	JFET Input Op Amp	1.10
LF398N	Sample & Hold Amplifiers	3.95
LM399H	Temp. Comp. Prec. Ref. (.5ppm/C°)	5.00
ADC0804LCN	8-Bit A/D Converter (1 LSB)	4.95
DAC0808LCN	8-Bit D/A Converter (0.78% Lin.)	2.95

DATA ACQUISITION (CONTINUED)

ADC0809CCN	8-Bit A/D Converter (8-Ch. Multi.)	5.25
ADC0817CCN	8-Bit A/D Converter (16-Ch. Multi.)	10.95
DAC1000LCN	10-Bit D/A Conv. Micro. Comp. (0.05%)	13.95
DAC1008LCN	10-Bit D/A Conv. Micro. Comp. (0.20%)	8.95
DAC1020LCN	10-Bit D/A Converter (0.05% Lin.)	8.49
DAC1022LCN	10-Bit D/A Converter (0.20% Lin.)	5.95
DAC1222LCN	12-Bit D/A Converter (0.20% Lin.)	9.95
CD4051N	8-Channel Multiplexer	1.19
AY-5-1013	30K BAUD UART	6.95

RAM'S

1101	256x1 Static	1.49
1103	1024x1 Dynamic	.99
2101 (8101)	256x4 Static	3.95
2102	1024x1 Static	1.75
21L02	1024x1 Static	1.95
2111 (8111)	256x4 Static	3.95
2112	256x4 Static MOS	4.95
2114	1024x4 Static 450ns	2.25
2114L	1024x4 Static 450ns Low Power	2.49
2114-2	1024x4 Static 200ns	2.49
2114L-2	1024x4 Static 200ns Low Power	2.95
74S200	256x1 Static	6.95
4116N-4 (UPD416)	16K Dynamic 250ns (MM5290N-4)	1.95
4164N-3	64K Dynamic 200ns	14.95
MM2147N	4096x1 Fast 70ns	4.95
5101	256x4 Static	7.95
MM5261	1024x1 Dynamic Fully Decoded	.95
MM5262	2Kx1 Dynamic	.49
MM5280/2107	4096x1 Dynamic	4.95
MM5290N-2 (4116)	16K Dynamic 150ns (UPD416C-3)	2.95
MM5298J-3A	8K Dyn. 250ns (lower ½ of MM5298J)	1.95
HM6116-4	16K (2Kx8) Static 200ns	14.95
82S25	64 Bit RAM (16x4OC)	2.49
UPD410/MK4027	4K Dynamic 16-pin	4.95
TMS4044-45NL	4K Static	9.95
TMS4045	1024x4 Static	9.95

PROMS/EPROMS

1702A	2K UV Erasable PROM	5.95
2708	8K EPROM	2.95
TMS2716	16K EPROM (-5V, +5V, +12V)	9.95
2716 Intel (2516) TI	16K EPROM (Single +5V)	8.95
2732 Intel TI	32K EPROM	17.95
2758	8K EPROM (450ns) (Single +5V)	7.49
2764Q	64K EPROM (Hitachi HN462764)	49.95
5203	2048 PROM	14.95
82S23 (74S188)	32x8 PROM (Open Collector)	3.95
82S115	4096 Bipolar PROM	14.95
82S123 (74S288)	32x8 Tri-State Bipolar PROM	3.95
82S136	8K PROM	16.95

— Over 30 More PROMS Listed in Our Catalog —

ROM'S

2513 (2140)	Character Generator (Upper Case)	9.95
2513 (3021)	Character Generator (Lower Case)	9.95

NMOS READ ONLY MEMORIES

MCM6571P	128x9x7 ASCII Shifted w/Greek	13.50
MCM6574P	128x9x7 Math Symbol & Pictures	13.50
MCM6575P	128x9x7 Alpha. Control Char. Gen.	13.50

MICROPROCESSOR MANUALS

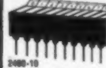
M-Z80	User Manual	7.50
M-CDP1802	User Manual	7.50
M-2650	User Manual	5.00

SPECIAL FUNCTION

DS0025CN	Dual MOS Clock Driver (5MHZ)	3.50
DS0026CN	Dual MOS Clock Driver (5MHZ)	1.95
INS1771N-1	Floppy Disc Controller	24.95
INS8251N	Communication Chip	10.95
MM58167N	Microprocessor Real Time Clock	8.95
MM58174N	Microprocessor Compatible Clock	11.95
COP402N	Microcontroller with 64-Digit RAM and Direct LED Drive	6.95
COP420MN	Microcontroller with 64-Digit RAM & Direct LED Drive w/N Buss Int.	7.49
COP470N	32-Seg. VAC Fluor. Driver (20-pin pkg.)	3.25

TELEPHONE/KEYBOARD CHIPS

AY-5-9100	Push Button Telephone Dialer	14.95
AY-5-9200	Repertory Dialer	14.95
AY-5-9500	CMOS Clock Generator	4.95
AY-5-2376	Keyboard Encoder (88 keys)	11.95
HD0165-5	Keyboard Encoder (16 keys)	7.95
74C922	Keyboard Encoder (16 keys)	5.49
74C923	Keyboard Encoder (20 keys)	5.75
MM53130N	Push Button Pulse Dialer	7.95
MM5740N	90/144-Key Serial Keyboard Encoder	8.95



2400-10

EECO Rocker DIP Switch — "Mini-Dip™" 2400 Series

THE MOST UNIQUE DIP SWITCH AVAILABLE!

MINI-DIP is designed to retrofit all major brands of Dip switches. Unique features include locking rod design to prevent accidental actuation and gold self-wiping contact. One-piece housing and press-fit terminals prevent contamination. 2-10 station Form "A" and 1-5 station Form "C." • Terminals on .100 x .300 (2.54 x 7.62) centers • PCB or dip socket mountable • Positive cleaning/wiping action with gold contact • Total seal and bottom seal

Part No.	Pos.	Configuration	Socket	Price
2400-2	2	12	8 pin	.79 - 10/ 6.95
2400-3	3	123	8 pin	.89 - 10/ 7.95
2400-4	4	1234	8 pin	.99 - 10/ 8.95
2400-ABCD	4	ABCD	8 pin	.99 - 10/ 8.95
2400-6C	6	C54321	14 pin	1.09 - 10/ 9.95
2400-6	6	123456	14 pin	1.09 - 10/ 9.95
2400-7	7	1234567	14 pin	1.19 - 10/10.95
2400-8	8	12345678	16 pin	1.29 - 10/11.95
2400-9	9	123456789	18 pin	1.39 - 10/12.95
2400-10	10	0123456789	20 pin	1.49 - 10/13.95

GRAB BAG SPECIALS

GB180 (Pictured Above)

CAPACITORS

Part No.	Description	Price
GB100	100 each Ceramic Disc (10pf—1mf)	$2.00
GB101	60 each Mylar	4.00
GB102	60 each Electrolytics	4.00
GB103	40 each Tantalum (tubular & dipped)	4.00
GB176	40 each Dipped Micas (10pf-1000pf @ 100-500V)	4.00

INTEGRATED CIRCUITS

GB108	50 each TTL Series — marked (7400, 74107, 74123, etc.)	$4.00
GB109	30 each Linear — marked (LM301, 307, 741, 380, etc.)	4.00
GB149	20 each Exar — marked (XR320, 1310, 4136, etc.)	4.00
GB150	20 each Shift Registers — marked (2510, 2518, 2522, 2533, etc.)	4.00
GB157	50 each DTL Series — marked (DM930, 932, 936, 946, etc.)	3.00
GB158	8 pcs. Positive Voltage Regulators (TO-3 case) (7805, 06, 12, 15, 18, 24, etc.) Linear marked	4.95
GB159	8 pcs. Negative Voltage Regulators (TO-3 case) (7905, 06, 12, 15, 18, 24, etc.) Linear marked	4.00
GB170	25 each Assorted 74LS TTL Series	4.00
GB172	10 pcs. 78M Positive Volt. Reg. (TO-5 case) (78M05, 8, 12, 15, 20, 24, etc.) Linear marked	5.00

LEDS — LAMPS — READOUTS

GB110	100 each Assorted LEDs (colors & sizes) (XC556, XC209, etc.)	$4.00
GB111	40 each NE-2 Neon Type Lamps	2.00
GB113	20 ea. Multiple Readouts, calculators, clocks, timers, LEDS to Panaplex — new, used and rejects	4.00
GB162	50 each 7-Segment Displays (various colors and sizes)	5.00

POTENTIOMETERS

GB112	30 each Miniature Trimmers (100 ohm-1 Meg)	$4.00
GB134	30 each 3/8" square single-turn PC Mount (unmarked — 10 ohm to 500 ohm) marked	3.00
GB135	30 each 3/8" square single-turn PC Mount (unmarked — 1K to 50K) marked	3.00
GB136	30 each 3/8" square single-turn PC Mount (unmarked — 100K to 5 Meg) marked	3.00
GB173	100 ea. 3/8" to single-turn PC Test & [illegible]	5.00
GB174	25 ea. ½ watt thumbwheel single turn 1000 ohm-5 Meg	2.00

DIODES

GB171	50 each Assorted Germanium (1N34, 1N60, 1N270)	$1.00
GB107	100 each Silicon (1N914/1N4148)	2.00
GB104	200 each marked, unmarked rectifiers & zeners	2.00
GB175	100 ea. 1 amp - 3 amp (cathode band) silicon rectifiers	2.00

RESISTORS

Part No.	Description	Price
GB116	200 each 1/4 watt resistor assortment	$2.00
GB117	200 each 1/2 watt resistor assortment	2.00
GB118	20 ea. Wire Wound 5,10,20W (1-100 ohm)	4.00
GB164	100 each 1 and 2 watt resistor assortment	3.00
GB178	500 each 1/4, 1/2, 1 watt (marked/unmarked) resistors	4.00

SWITCHES

GB120	20 each Miniature slide	$2.00
GB122	20 ea. Reed relays with coil and magnet — glass tube	5.00
GB165	40 pcs. toggle, rocker, pushbutton	10.00
GB179	20 each Dip Switches (asst. assortment)	8.00

HARDWARE

GB139	40 each Terminal Strips (solder and screw types (2 to 8 terminals))	$3.00
GB140	100 each Spacers, standoff, insulators (metal, nylon and plastic)	2.00
GB141	200 each Washers and Spacers (nylon and teflon)	3.00
GB142	50 ea. Chassis mounting feet (rubber and plastic)	2.00
GB144	200 each Solder lugs (small)	2.00
GB145	100 each Lugs — crimp-on (some insulated)	2.00
GB146	100 each Grommets, cord strain reliefs and hole plugs	3.00
GB147	500 each Hardware mix (nuts, bolts, screws, lugs)	5.00
GB166	40 Threaded metal and plastic spacers (½-2" long)	2.00
GB167	250 pcs. sheet metal and metal tapping screws	3.00
GB168	200 pcs. angle brkts, clip insulators, etc.	3.00
GB169	150 pcs. tie wraps and harness clips (2-6")	3.00
GB180	100 pcs. Robot/Slot Car gears, shafts, wheels, motors	5.00

MISCELLANEOUS

GB123	20 each Heat Sinks — assorted sizes	$3.00
GB124	8 each assorted calculator type keyboards	5.00
GB126	50 each Opto-Isolators — IL-1 Series (untested)	2.00
GB127	100 each Transistors — plastic and metal	3.00
GB128	20 each Toroid Cores — iron and tape	4.00
GB129	50 each Photo Transistors (LPT)	4.00
GB130	1 each Tape Drive — 6V motor with reel/cassette [illegible]	5.00
GB131	20 each 6" shrink tubing, asst. sizes and colors	4.00
GB137	50 each Chokes, coils and inductors (molded core adjustable)	3.00
GB138	2 each Speakers, 2½", 8 ohm, 1/4 watt	1.00
GB155	200 each mixed resistors, capacitors, diodes, transistors, chokes	3.00
GB160	Printed Circuit Board Contains 50-75 components on each board	3.00
GB163	20 ea. Sockets (Asst. IC and transistor)	4.00
GB177	200 each 1" Shrink tubing, asst. colors and sizes	3.00

$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6% Sales Tax
Postage — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Monthly Sale Flyer!

Spec Sheets — 25¢
Send 88¢ Postage for your
FREE 1982 JAMECO CATALOG
Prices Subject to Change

NEW 1982 CATALOG

Mail Order Electronics · Worldwide

Jameco® ELECTRONICS

✓38

1355 SHOREWAY ROAD, BELMONT, CA 94002
PHONE ORDERS WELCOME — (415) 592-8097

4/82

BOOKS

National Semiconductor — Intersil — Intel

30001	National CMOS Data Book (840 pages) 74C, CD4000, and A/D Converters	$6.95
30002	National Interface Data Book (704 pages) DP, DS8000, DS3600, DS75000, etc.	$6.95
30003	National Linear Data Book (1376 pages) LM, LF, ADC, DAC, LH Series	$6.95
30004	National Series 80 — Board Level Computer (224 pages)	$4.95
30005	National TTL Logic Data Book (624 pages) 7400, LS, L, H, S, and DM8000 Series	$6.95
30006	Buy above (3) 30001,3,5 as a set	$19.95/lot
30009	Intersil Data Book (1074 pages)	$6.95
010400	Intel Component Data Catalog — Full data sheets for Intel's products incl. memory devices, microproc., peripherals & indust./mil. products (1328 pages)	$10.00
200010	Intel Peripheral Design Handbook — Full data sheets, appl. notes for Intel peripheral device components (944 pages)	$7.50

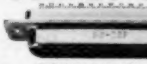
AC and DC Wall Transformers

With Universal Plug and 9V Battery Snap

Selective voltages: 6,9,12VDC. Polarity selection (+/-). six-foot line from adapter to plugs — six-inch line from adapter to battery snap. 120V/60Hz. 300mA.

Part No.	Input	Output	Price
AC 250	117V/60Hz	12VAC 250mA	$3.95
AC 500	117V/60Hz	12VAC 500mA	$4.95
AC1000	117V/60Hz	12VAC 1 amp	$5.95
AC1700	117V/60Hz	9VAC 1.7 amp	$3.95
DC 800	120V/60Hz	8VDC 400mA (batt. charger)	$2.49
DC6912 (above)	120V/60Hz	6,9,12VDC 300mA	$9.95
DV9200	117V/60Hz	9VDC 200mA	$3.25
DC900	120V/60Hz	9VDC 500mA	$3.95
DC1200	120V/60Hz	12VDC 300mA	$3.95

CONNECTORS



DB25P	**D-Subminiature Plug**	**$2.95**
DB25S	**D-Subminiature Socket**	**$3.50**
D20418-2	**Screw Lock Hdwr. (2) DB25S/P**	**2/$.99**
DB51226	**Cover for DB25P/S**	**$1.75**
22/44SE	**P.C. Edge (22/44 Pin)**	**$2.95**
UG88/U	**BNC Plug**	**$1.79**
UG89/U	**BNC Jack**	**$3.79**
UG175/U	**UHF Adapter**	**$ .49**
SO239	**UHF Panel Recp.**	**$1.29**
PL258	**UHF Adapter**	**$1.60**
PL259	**UHF Plug**	**$1.60**
UG260/U	**BNC Plug**	**$1.79**
UG1094/U	**BNC Bulkhead Recp.**	**$1.29**

TRS-80 16K Conversion Kit

Expand your 4K TRS-80 System to 16K
Kit comes complete with:

- 8 ea. MM5290 (UPD416/4116) 16K Dyn. Ram (*ns)
- Documentation for conversion

TRS-16K2 *150ns **19.95**
TRS-16K3 *200ns **16.95**
TRS-16K4 *250ns **14.95**

KEYBOARDS

Datanectics 74-Key Keyboard

Uses EA 20134 Chip (Electronic Arrays). Size: 16¾"L x 5½"W x 1-3/8"H. White, black, blue, grey key caps. (No Data Sheet) —

Part No. KB354 .... $29.95 ea.

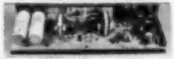
Micro Switch 69-Key Keyboard

Uses AMI SW20360K Chip. Size: 16-3/8"L x 5¼"W x 1-5/8"H Metal Frame. Light & dark grey key caps (No Data Sheet)

Part No. KB69SD12-2 .... $19.95 ea.

Boschert Multi-Voltage Power Supply

5VDC, 12VDC and 24VDC



FEATURES: Voltages*: 5VDC @ 25amps, 12VDC @ 4amps, & 24VDC @ 4amps. Reg. Load: +5V out ±1%, +12 & 24V out ±5% (20-100% load). Overvolt. & overcurr. protection. 115 or 230VAC input. Wt. 4 lbs. Size: 4.95" x 2.90" x 15.90"
*Total average output shall not exceed 290 watts.

General Description: The "Boschert" Power Supply was originally designed for application with ITT Advance Terminal Controller (ATC). This open frame switching power supply provides user with high current requirements common in use with computer systems. Its compact size provides versatility for mounting into electronic enclosures. Each supply has 6 threaded fasteners (pem nut type) for mounting. Specification requirements to be used with ATC enclosed.

Part No. 200-3010 .... $69.95 each

— MANY OTHERS AVAILABLE • WRITE FOR INFORMATION —

JE600 Hexadecimal Encoder Kit

FULL 8-BIT LATCHED OUTPUT 19-KEY KEYBOARD

The JE600 Encoder Keyboard Kit provides two separate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 9 LED readouts. Also included is a key entry strobe. Features: Full 8-bit latched output for microprocessor use. Three user-define keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for operation. Size: 3½"H x 8¾"W x 8¾"D

JE600/DTE-HK (After assembled as pictured above) **$99.95**

JE600 Kit 19-Key Hexadec. Keyboard, PC Board & Cmpnts. (no case) .. **$59.95**

K19 19-Key Keyboard (Keyboard only) **$14.95**

DTE-HK (case only — 3½"Hx8¾"Wx8¾"D) **$44.95**

Why use their flexible discs:

Athana, BASF, Control Data, Dysan, IBM, Maxell, Nashua, Scotch, Shugart, Syncom, 3M, Verbatim or Wabash

when you could be using

MEMOREX

high quality error free discs?

Product Description	Part #	CE quant. 100 price per disc ($)
8″ SSSD IBM Compatible (128 B/S, 26 Sectors)	3062	2.09
8″ SSSD Shugart Compatible, 32 Hard Sector	3015	2.09
8″ SSDD IBM Compatible (128 B/S, 26 Sectors)	3090	2.74
8″ DSDD Soft Sector (Unformatted)	3102	3.14
8″ DSDD Soft Sector (128 B/S, 26 Sectors)	3115	3.34
8″ DSDD Soft Sector (1024 B/S, 8 Sectors)	3104	3.34
8″ DSDD Burroughs B-80 Comp., 32 Hard Sector	3092	3.34
5¼″ SSSD Soft Sector (Unformatted)	3401	1.94
5¼″ SSDD Soft Sector w/Hub Ring	3481	2.34
5¼″ SSDD 10 Hard Sector w/Hub Ring	3483	2.34
5¼″ SSDD 16 Hard Sector w/Hub Ring	3485	2.34
5¼″ DSDD Soft Sector w/Hub Ring	3491	3.09
5¼″ DSDD 10 Hard Sector w/Hub Ring	3493	3.09
5¼″ DSDD 16 Hard Sector w/Hub Ring	3495	3.09

SSSD = Single Sided Single Density; SSDD = Single Sided Double Density
DSDD = Double Sided Double Density

Memorex Flexible Discs...The Ultimate in Memory Excellence

Quality
Memorex means quality products that you can depend on. Quality control at Memorex means starting with the best materials available. Continual surveillance throughout the entire manufacturing process. The benefit of Memorex's years of experience in magnetic media production, resulting, for instance, in proprietary coating formulations. The most sophisticated testing procedures you'll find anywhere in the business.

100 Percent Error Free
Each and every Memorex Flexible Disc is certified to be 100 percent error free. *Each* track of *each* flexible disc is tested, individually, to Memorex's stringent standards of excellence. They test signal amplitude, resolution, low-pass modulation, overwrite, missing pulse error and extra pulse error. They are torque-tested, and competitively tested on drives available from almost every major drive manufacturer in the industry including drives that Memorex manufacturers. Rigid quality audits are built into every step of the manmanufacturing process and stringent testing result in a standard of excellence that assures you, our customer, of a quality product designed for increased data reliability and consistent top performance.

Customer-Oriented Packaging
Memorex's commitment to excellent does not stop with a quality product. They are proud of their flexible discs and they package them with pride. Both their packaging and their labeling have been designed with your ease of identification and use in mind. The desktop box containing ten discs is convenient for filing and storage. Both box labels and jacket labels provide full information on compatibility, density, sectoring, and record length. Envelopes with multi-language care and handling instructions and and color-coded removable labels are included. A write-protect feature is available to provide data security.

Full One Year Warranty—Your Assurance of Quality
Memorex Flexible Discs will be replaced free of charge by Memorex if they are found to be defective in materials or workmanship within one year of the date of purchase. Other than replacement, Memorex will not be responsible for any damages or losses (including consequential damages) caused by the use of Memorex Flexible Discs.

Quantity Discounts Available
Memorex Flexible Discs are packed 10 discs to a carton and 10 cartons to a case. Please order only in increments of 100 units for quantity 100 pricing. We are also willing to accommodate your smaller orders. Quantities less than 100 units are available in increments of 10 units at a 10% surcharge. **Quantity discounts** are also available. Order 500 or more discs at the same time and deduct 1%; 1,000 or more saves you 2%; 2,000 or more saves you 3%; 5,000 or more saves you 4%; 10,000 or more saves you 5%; 25,000 or more saves you 6%; 50,000 or more saves you 7% and 100,000 or more discs earns you an 8% discount off our super low quantity 100 price. Almost all Memorex Flexible Discs are immediately available from **CE**. Our warehouse facilities are equipped to help us get you the quality product you need, when you need it. If you need further assistance to find the flexible disc that's right for you, call the Memorex compatibility hotline. Dial 800-538-8080 and ask for the *flexible disc hotline* extension 0997. In California dial 800-672-3525 extension 0997. Outside the U.S.A. dial 408-987-0997.

Buy with Confidence
To get the fastest delivery from **CE** of your Memorex Flexible Discs, send or phone your order directly to our Computer Products Division. Be sure to calculate your price using the **CE** prices in this ad. Michigan residents please add 4% sales tax. Written purchase orders are accepted from approved government agencies and most well rated firms at a 30% surcharge for net 30 billing. All sales are subject to availability, acceptance and verification. All sales are final. Prices, terms and specifications are subject to change without notice. Out of stock items will be placed on backorder automatically unless **CE** is instructed differently. Minimum order $50.00. International orders are invited with a $20.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Non-certified and foreign checks require bank clearance.

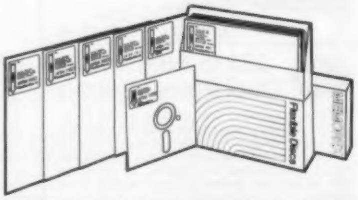
Mail orders to: **Communications Electronics**, Box 1002, Ann Arbor, Michigan 48106 U.S.A. Add $8.00 per case or partial-case of 100 8-inch discs or $6.00 per case or partial case of 100 5¼-inch mini-discs for U.P.S. *ground* shipping and handling in the continental U.S.A. If you have a Master Card or Visa card, you may call anytime and place a credit card order. **Order toll-free** in the U.S. Call anytime 800-521-4414. If you If you are outside the U.S. or in Michigan, dial 313-994-4444. Order your high quality, error free Memorex discs today.

Copyright ©1982 Communications Electronics™

High Quality Error Free

MEMBER
VISA
MasterCard

Order Toll-Free!
(800) 521-4414
In Michigan (313) 994-4444



For Data Reliability—Memorex Flexible Discs

™
COMMUNICATIONS
ELECTRONICS™ ~377

Computer Products Division

854 Phoenix ☐ Box 1002 ☐ Ann Arbor, Michigan 48106 U.S.A.
Call TOLL-FREE (800) 521-4414 or outside U.S.A. (313) 994-4444

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	7A	14	14	14
ARGENTINA	14A	14	14	14	7B	7A	14A	21	21A	21A	21A	21A
AUSTRALIA	21A	14	14	7B	7B	7B	14B	14	14	21	21A	21A
CANAL ZONE	14A	14	14	14	7	7	14	21	21A	21A	21A	21A
ENGLAND	7	7	7	7	7	7A	14	14	21A	21A	21	14
HAWAII	21A	14	7A	7	7	7	7	7	14	21	21	21A
INDIA	14	7A	7B	7B	7B	7B	14	14A	14A	14	14	14
JAPAN	21A	14	14B	7B	7B	7B	7	7	7	14B	14	21
MEXICO	21	14	14	7	7	7	14	14	21	21A	21A	21A
PHILIPPINES	14A	14	7B	7B	7B	7B	7B	7B	14B	14	14	21A
PUERTO RICO	14	14	7	7	7	7	14	14	21A	21A	21	21
SOUTH AFRICA	14A	14	7	7A	14	14	21A	21A	21A	21A	21A	21A
U. S. S. R.	7	7	7	7	7	7B	14	14	21A	21A	14	7
WEST COAST	21A	21	14	7	7	7	7A	14	21	21A	21A	21A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	14	7A	7	7	7	7	7	7A	14	14	14A
ARGENTINA	21A	14A	14	14	7A	7A	14	14A	21A	21A	21A	21A
AUSTRALIA	21A	14	14	14	7B	7B	14B	14	14	21A	21A	21A
CANAL ZONE	14A	14	14	14	7A	7	14	21	21A	21A	21A	21A
ENGLAND	7	7	7	7	7	7	7B	14	21	21A	21	14
HAWAII	21A	21	14	14	7	7	7	7	14	21	21A	21A
INDIA	14	14	7B	7B	7B	7B	7B	14	14	14	14	14
JAPAN	21A	21	14	7B	7B	7B	7	7	7	14	14	21
MEXICO	21	14A	14	7	7	7	7A	14	14A	21	21A	21A
PHILIPPINES	21	14	7A	7B	7B	7B	7B	7B	14B	14	14	21A
PUERTO RICO	21	14	14	7	7	7	14	14	21	21A	21A	21
SOUTH AFRICA	14A	14	7	7B	7B	14B	14	21	21A	21A	21A	21A
U. S. S. R.	7B	7	7	7	7	7B	7B	14	14A	14B	14	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	14	14	7A	7	7	7	7	7A	14	14	14A
ARGENTINA	21A	21A	14A	14	7A	7A	14	14A	21A	21A	21A	21A
AUSTRALIA	21A	21A	14A	14	14	14	7B	14	14	21A	21A	21A
CANAL ZONE	21A	21	14	14	7A	7A	14	21	21A	21A	21A	21A
ENGLAND	7B	7B	7	7	7	7	7B	14B	14	21	14A	14
HAWAII	21A	21A	14A	14	14	14	7A	7	14	21A	21A	21A
INDIA	14A	14	14	7B	7B	7B	7B	7B	14	14	14	14
JAPAN	21A	21A	21	14	7B	7B	7	7	7	14	14	21
MEXICO	21A	21	14	7	7	7	7	14	21	21	21A	21A
PHILIPPINES	21A	21	14A	14	14B	7B	7B	7	14B	14	14	21A
PUERTO RICO	21A	14A	14	7A	7	7	7A	14	21	21A	21A	21A
SOUTH AFRICA	14A	14	7	7B	7B	7B	14B	14	14A	21A	21A	21A
U. S. S. R.	7B	7B	7	7	7	7B	7B	14B	14	14	14	7B
EAST COAST	21A	21	14	7	7	7	7A	14	21	21A	21A	21A

First letter = day waves Second = night waves
A = Next higher frequency may also be useful
B = Difficult circuit this period F = Fair G = Good
P = Poor * = Chance of solar flares; # = of aurora

APRIL

SUN	MON	TUE	WED	THU	FRI	SAT
				1 G/F	2 G/G	3 G/G
4 G/G	5 G/G	6 G/F	7 G/G	8 G/G	9 G/F	10 G/F
11 F/F	12 F/F	13 G/G	14 G/G	15 G/G	16 F/F*	17 G/G
18 G/G	19 G/G	20 G/G	21 F/F	22 F/P	23 F/F	24 G/G
25 G/G	26 F/F*	27 F/F*	28 F/F*	29 F/P*	30 F/F	

DEALER DIRECTORY

Phoenix AZ

The Southwest's most progressive communications company stocking Kenwood, Icom, Yaesu, MFJ, B&W, Astron, Larsen, Cushcraft, Hy-Gain, Bearcat, and more. Would like to serve you! **Power Communications Corp., 1640 West Camelback Rd., Phoenix AZ 85015, 241-Watt.**

Culver City CA

Jun's Electronics, 3919 Sepulveda Blvd., Culver City CA 90230, 390-8003. Trades 463-1886 San Diego. Call us for a low quote.

Fontana CA

Complete lines ICOM, DenTron, Ten-Tec, Mirage, Cubic, Lunar, over 4000 electronic products for hobbyist, technician, experimenter. Also CB radio, landmobile. **Fontana Electronics, 8628 Sierra Ave., Fontana CA 92335, 822-7710.**

San Diego CA

We buy and sell Surplus Army Navy Electronic, also Terminated Material. What do you want to sell? Write for catalogue. **Electronictown, Inc., 440-7th Avenue, PO Box 2048, San Diego CA 92112, 232-9379.**

San Jose CA
SAN FRANCISCO BAY AREA

Homebrewers' haven; tons of new and used Ham/Computer gear and components. Serving Hams since 1958. We specialize in ICOM, KLM, Mirage, Comptronix. We ship worldwide. **Tele-Com Electronics, 15460 Union Avenue, San Jose CA 95124, 377-4479.**

San Jose CA

Bay area's newest Amateur Radio store. New & used Amateur Radio sales & service. We feature Kenwood, ICOM, Azden, Yaesu, Ten-Tec, Santee & many more. **Shaver Radio, Inc., 1378 So. Bascom Ave., San Jose CA 95128, 998-1103.**

Smyrna GA

For your Kenwood, Yaesu, ICOM, Drake and other amateur needs, come to see us. **Britt's Two-Way Radio, 2506 N. Atlanta Rd., Smyrna GA 30080, 432-8006.**

Preston ID

Ross WB7BYZ, has the Largest Stock of Amateur Gear in the Intermountain West and the Best Prices. Call me for all your ham needs. **Ross Distributing, 78 So. State, Preston ID 83263, 852-0830.**

Terre Haute IN

Your ham headquarters located in the heart of the midwest. **Hoosier Electronics, Inc., #9 Meadows Center, P.O. Box 3300, Terre Haute IN 478003, 238-1456.**

Littleton MA

The ham store of N.E. you can rely on. Kenwood, ICOM, Wilson, Yaesu, DenTron, KLM amps, B&W switches & wattmeters. Whistler radar detectors, Bearcat, Regency, antennas by Larsen, Wilson, Hustler, GAM. **TEL-COM Inc. Communications & Electronics. 675 Great Rd., Rt. 110, Littleton MA 01460, 486-3040.**

Ann Arbor MI

See us for products like Ten-Tec, R. L. Drake, Dentron and many more. Open Monday through Saturday, 0830 to 1730. WB8VGR, WB8UXO, WD8OKN and W8RP behind the counter. **Purchase Radio Supply, 327 E. Hoover Ave., Ann Arbor MI 48104. 668-8696.**

Hudson NH

New England's Distributor and Authorized Service Center for all Major Amateur Lines. **Tufts Radio Electronics, Inc., 61 Lowell Road, Hudson NH 03051, 883-5005.**

Somerset NJ

New Jersey's only factory-authorized ICOM and YAESU distributor. Large inventory of new and used specials. Most major brands in stock. Complete service and facilities. **Radios Unlimited, 1760 Easton Avenue, P.O. Box 347, Somerset NJ 08873; 469-4599.**

Philadelphia PA/ Camden NJ

Waveguide & Coaxial Microwave Components & Equipment. Laboratory Grade Test Instruments, Power Supplies, Buy, Sell & Trade all popular makes—HP, GR, FXR, ESI, Sorensen, Singer, etc. **Lectronic Research Labs, 1423 Ferry Ave., Camden NJ 08104, 541-4200.**

Amsterdam NY
UPSTATE NEW YORK

Kenwood, ICOM, Drake, plus many other lines, Amateur Dealer for over 35 years. **Adirondack Radio Supply, Inc., 185 West Main Street, Amsterdam NY 12010, 842-8350.**

Syracuse-Rome-Utica NY

Featuring: Kenwood, Yaesu, ICOM, Drake, Ten-Tec, Swan, DenTron, Alpha, Robot, MFJ, Tempo, Astron, KLM, Hy Gain, Mosley, Larsen, Cushcraft, Hustler, Mini Products. You won't be disappointed with equipment/service. **Radio World, Oneida County Airport-Terminal Building, Oriskany NY 13424, 337-0203.**

Columbus OH

The biggest and best Ham Store in the midwest featuring quality Kenwood products with working displays. We sell only the best. Authorized Kenwood Service. **Universal Amateur Radio Inc., 1280 Aida Dr., Reynoldsburg (Columbus) OH 43068, 866-4267.**

Bend OR

Satellite TV. Known brands. Call today for more information and inquire about our dealer program. **WESPERCOM, P.O. Box 7226, Bend OR 97708, 389-0996.**

Scranton PA

ICOM, Bird, CushCraft, Beckman, Fluke, Larsen, Hustler, Antenna Specialists, Astron, Avanti, Belden, W2AU/W2VS, CDE, AEA, Vibroplex, Ham-Key, CES, Amphenol, Sony, Fanon/Courier, B&W, Ameco, Shure. **LaRue Electronics, 1112 Grandview St., Scranton PA 18509, 343-2124.**

San Antonio TX

Amateur, Commercial 2-say. Selling Antenna Specialists, Avanti, Azden, Bird, Hy-gain, Standard, Vibroplex, Midland, Henry, CushCraft, Dielectric, Hustler, ICOM, MFJ, Nye, Shure, Cubic, Tempo, Ten-Tec and others. **Appliance & Equipment Co., Inc. 2317 Vance Jackson Road, San Antonio TX 78213, 938-3350.**

Vienna VA

The Washington metropolitan area's leading supplier of the latest in Amateur Radio and Test Equipment. On your next trip to the Nation's Capital, stop by and see us. **Electronic Equipment Bank, Inc., 516 Mill St. N.E., Vienna VA 22180, 938-3350.**

DEALERS

Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the June '82 issue must be in our hands by April 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

World Class Performance and Features

The FT-ONE is the culmination of an all-out design project by Yaesu's top engineering team. Working without the usual cost constraints, Yaesu's design group is proud to unveil the instrument they "always wanted to design," a revolutionary blend of computer and RF technology.

GENERAL COVERAGE, ALL SOLID STATE

The FT-ONE is a full-coverage all-mode transceiver, equipped for reception on any frequency between 150 kHz and 29.99 MHz, with transmit coverage on all nine present and proposed amateur bands. In countries where permitted, the FT-ONE may be programmed to transmit throughout the 1.8-29.99 MHz range.

KEYBOARD FREQUENCY ENTRY

Fully digitally synthesized, the FT-ONE uses a front panel keyboard for initial frequency entry. Frequency change is then accomplished via the main tuning dial or the pushbutton scanner, with tuning in either 10 Hz or 100 Hz steps possible. Truly the contester's dream, the FT-ONE permits extremely fine tuning and instantaneous band change with equal facility.

DUAL VFO SYSTEM

Ten digital VFO's with memory are provided, in conjunction with an A-B selection scheme that allows instant recall of any transmit, receive, or transceive frequency desired. For split-frequency operation, such as on 7 MHz SSB, the operator may select TX on VFO-A and RX on VFO-B, automatically storing the calling and listening frequencies for each pile-up. For net operations, a non-volatile memory board is available as an option, to eliminate the possibility of dumping memory.

FULL CW BREAK-IN

Recent advances in solid-state technology have finally made full CW break-in reliable enough to be incorporated into a Yaesu product. Now you can select traditional semi-break-in (for use with amplifiers not equipped for full break-in) or full high-speed break-in. When using amplifiers so equipped, the keyer output lead may be interrupted via a rear panel jack and routed to the break-in sequencing input on your amplifier.

SWITCHING REGULATOR POWER SUPPLY

Extremely compact and light in weight, the switching regulator power supply reduces substantially the space required to produce the operating voltages used in the FT-ONE. Highly efficient and uniquely stable, the switching regulator supply provides superb reliability in a field of design long neglected by amateur manufacturers.

ELITE CLASS PERFORMANCE FEATURES

In addition to the full break-in and superb receiver filters, Yaesu's design team packed the FT-ONE with subtle virtues that others might have overlooked. Rear panel jacks allow the use of both an external receiver and an independent receive antenna, such as a 160 meter Beverage. While scanning, automatic halting on a received signal may be programmed . . . perfect for watching a band for openings. If you're a DX-peditioner, an optional Curtis 8044 keyer board is available, so you won't need an external keyer that only wastes suitcase space. And if your amplifier fan is louder than it should be, there's even a microphone squelch (AMGC) to reduce background noise pickup between words and sentences!

ONE YEAR FACTORY WARRANTY

Because of the level of attention to design detail, parts selection, and factory quality control, your FT-ONE is backed by a one-year *factory* warranty for the original purchaser at retail. Prompt and meticulous attention to your warranty needs will be provided by our Ohio And California Service Centers. In addition, all units sold in the United States will be inspected and tested after clearing Customs, and will include a Service Manual in the puchase price.

GAIN/INTERCEPT OPTIMIZED RECEIVER FRONT END

Utilizing up-conversion with a first IF of 73 MHz, the FT-ONE RF amplifier stage uses push-pull power transistors configured to produce a typical output intercept of +40 dBm. The first mixer utilizes a diode ring module followed by a low noise post amp, for optimum noise figure consistent with modern day intercept requirements. The result is a receiver with a typical two-tone dynamic range well in excess of 95 dB (14 MHz, CW bandwidth). Additional gain tailoring is provided via a PIN diode attenuator controlled from the front panel.

FILTERS READY FOR COMPETITION

Three filter bandwidths are available for CW operation (two for FSK!), using optional 600 Hz or 300 Hz crystal filters. Filter insertion losses are equalized for constant IF gain. Both IF Shift and Variable Bandwidth are provided, and two CW filters may be cascaded, for competition-grade selectivity. For SSB work, the Variable Bandwidth feature eliminates the need for costly 1.5 kHz or 1.8 kHz filters, as any intermediate bandwidth may easily be programmed using the standard, cascaded SSB filters. To top it all off, a high-performance audio peak and notch filter is standard equipment.

EXPANDED OPERATING DISPLAYS

Digital displays for the VFO Frequency, memory channel, and RIT offset are provided for quick frequency identification. The large front panel meter provides easy viewing of transceiver operating parameters, including final transistor collector current, input DC voltage, FM discriminator center tuning, speech processor compression level, and forward/reflected relative power.

NOT AVAILABLE AS OPTIONS

It's hard to believe that other manufacturers still insist on making such essential items as a noise blanker or speech processor extra-cost options. We find that these are less expensive to incorporate and more reliable in operation when installed on our assembly line. No AC power supply is available as an option for the FT-ONE, either; it's equipped for operation from 100/110/117/200/220/234 volts AC or 13.5 volts DC. And it goes without saying that there will not be an external VFO offered for the FT-ONE — we're confident that ten VFO's are quite enough!

Experience the FT-ONE in your Authorized Yaesu Dealer's showroom today.
This may be the last Amateur transceiver you will ever own. ✓83

Warranty policy available upon request. SASE, please.

Specifications subject to change without notice or obligation.

FT-ONE

YAESU FT-ONE
General Coverage All Mode Solid State Transceiver

A Bold Adventure In Engineering!

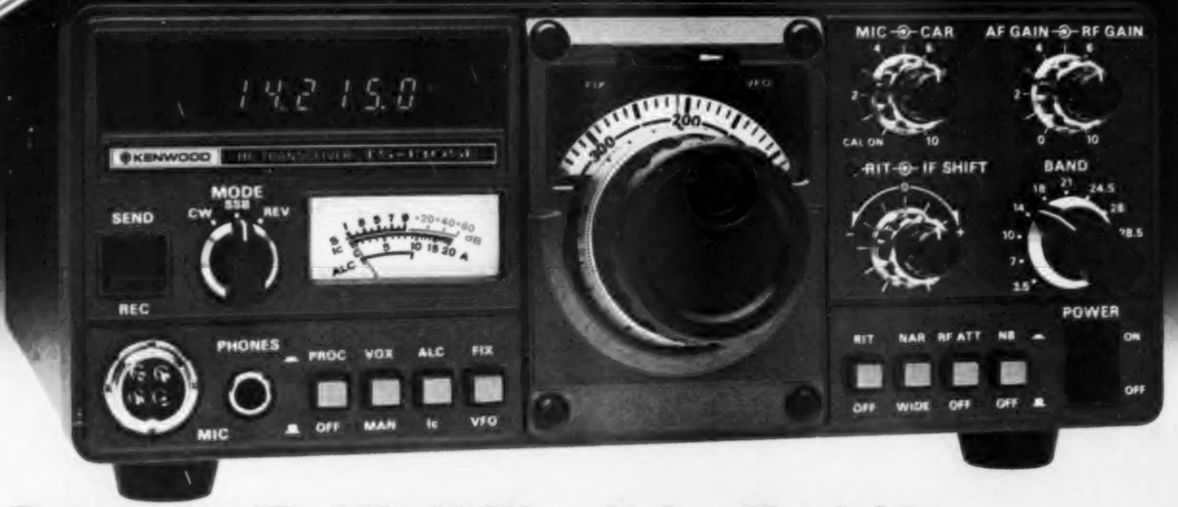
YAESU
The radio.

1081

YAESU ELECTRONICS CORPORATION, 6851 Walthall Way, Paramount, CA 90723 ● (213) 633-4007
Eastern Service Ctr., 9812 Princeton-Glendale Rd., Cincinnati, OH 45246 ● (513) 874-3100

NEW

Small talk.



Processor, IF shift, N/W switch, affordable

TS-130SE

An incredibly compact, full-featured, reasonably priced, all solid-state HF SSB/CW transceiver for both mobile and fixed operation. It covers 3.5 to 29.7 MHz (including the three new Amateur bands) and features digital display, IF shift, speech processor, and narrow/wide filter selection on both SSB and CW.

TS-130SE FEATURES:

- **80-10 meters, including three new bands**
  Covers all Amateur bands from 3.5 to 29.7 MHz, including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz. VFO covers more than 50 kHz above and below each 500-kHz band.
- **Two power versions...easy operation**
  TS-130SE runs 200 W PEP/160 W DC on 80-15 meters, and 160 W PEP/140 W DC on 12 and 10 meters. TS-130V runs 25 W PEP/20 W DC input on all bands. Solid-state, wideband final amplifier eliminates transmitter tuning; receiver wideband RF amplifiers eliminate preselector peaking.
- **Digital display built-in**
  Six-digit green fluorescent tube display indicates operating frequency to 100 Hz, external VFO or fixed-channel frequency, RIT shift, and CW transmit-receive shifts. Analog subdial back-up.
- **Built-in Speech Processor**
  Increases audio punch and average SSB output power.
- **IF shift circuit**
  Very effective in eliminating interfering signals, by placing them outside the IF passband.
- **CW narrow/wide selection**
  "N-W" switch allows selection of wide or narrow bandwidths. Wide CW and SSB bandwidths are the same. Optional YK-88C (500 Hz) or YK-88CN (270 Hz) filter may be installed for narrow CW.
- **SSB narrow selection**
  "N-W" switch allows selection of narrow SSB bandwidth to eliminate QRM, when optional YK-88SN (1.8 kHz) filter is installed. (CW filter may still be selected in CW mode.)
- **Sideband mode selected automatically**
  LSB on 40 meters and below; USB on 30 meters and above. SSB REVERSE position on MODE switch.
- **RF Attenuator, built-in**
  Allows optimum rejection of IM distortion.
- **Single conversion PLL system**
  Provides improved stability and spurious characteristics.
- **Protection circuit for final amplifier.**
  For maximum reliability, the final amplifier is protected by circuitry that monitors VSWR and temperature. (TS-130V, VSWR only.) Output power is reduced when abnormal operating conditions occur. If especially severe operation is anticipated, optional cooling fan, model FA-4, may be added. Model TS-130S, with FA-4 installed, is also available.
- **Effective noise blanker**
  Eliminates pulse-type noise.
- **Compact and lightweight**
  Only 3-3/4 H x 9-1/2 W x 11-9/16 D (inches); weight 12.3 lbs.
- **Other important features include:**
  VOX for SSB, CW semi break-in with sidetone, one fixed channel, and 25 kHz marker.

Optional DFC-230 Digital Frequency Controller
Allows frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Includes four memories (handy for split-frequency operation) and digital display. Covers 100 kHz above and below each 500-kHz band. Very compact.

More information on the TS-130 Series is available from all authorized dealers of

Trio-Kenwood Communications
1111 West Walnut Street
Compton, California 90220.

KENWOOD
...pacesetter in amateur radio

Matching accessories for fixed station operation:

- PS-30 base station power supply (remotely switchable ON or OFF with TS-130SE power switch).
- SP-120 external speaker
- VFO-120 remote VFO
- MC-50 50kΩ/500Ω desk microphone

Other accessories not shown:

- FA-4 fan unit for TS-130SE
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters
- YK-88SN (1.8 kHz) narrow SSB filter
- AT-130 compact antenna tuner (80-10 meters, including 3 new bands)
- MB-100 mobile mounting brackets
- KPS-21 base station power supply (also for TS-130SE)
- TL-922A linear amplifier
- PS-20 base-station power supply for TS-130V
- PC-1 phone patch
- HC-10 world digital clock
- MC-30S and MC-35S noise cancelling hand microphones
- MC-60 deluxe desk microphone
- SP-40 compact mobile speaker
- HS-4, HS-5, and HS-6 headphones

Specifications and prices are subject to change without notice or obligation.